AD-A125 819 USAF (UNITED STATES AIR FORCE) AVIONICS MASTER PLAN(U) 1/3
DEPARTMENT OF THE AIR FORCE WASHINGTON DC DEC 82

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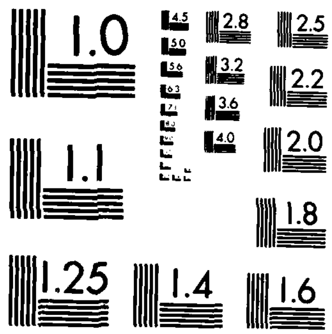
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AVIONICS MASTER PLAN

DECEMBER 1982

DEPARTMENT OF THE AIR FORCE
JOINT ASD-AFALD DEPUTY FOR AVIONICS CONTROL (AFSC/AFLC)
WRIGHT-PATTERSON AIR FORCE BASE. OHIO 45433

REPLY TO ATTN OF: AX

SUBJECT: USAF Avionics Master Plan

TO: See Distribution List

1. The attached USAF Avionics Master Plan (AMP) is being distributed in accordance with AFR 800-28, "Air Force Policy on Avionics Acquisition and Support." It supersedes all previous versions of the AMP including the revision dated February 1982 and the coordination draft dated October 1982.

2. This AMP incorporates changes submitted during the previous coordination processes and updates budgetary and program information to reflect the current status. It also includes significant changes in format, is reduced in volume and is now unclassified for the convenience of AMP users.

3. Readers are requested to provide further comments concerning ways in which the AMP is being used and suggest improvement for future versions. These comments may be submitted on the attached questionnaire to the Deputy for Avionics Control, Directorate of Plans and Management Information (ASD-AFALD/AXP), Wright-Patterson AFB, Ohio 45433 (Autovon 785-5694, Commercial (513)255-5694).

GEORGE W. BOBBYL
Colonel, USAF
Deputy for Avionics Control

2 Atch
1. AMP User's Questionnaire
2. AMP, Dated Dec 82

USAF AVIONICS MASTER PLAN (AMP)
USER'S QUESTIONNAIRE

The objectives of this questionnaire are to assist ASD-AFALD/AXP in:

1. Understanding how the AMP is currently being used and ...

2. Improving the AMP so that it better meets the needs of its various users.

The questionnaire is designed for ease of completion. Brief comments are usually sufficient to provide meaningful feedback. If you require more space to comment on any aspect, please attach an additional sheet. Questions regarding any aspect of this survey should be directed to Lt Col Ray White or Mr. George Baum at AUTOVON 785-5694 or Commerical (513) 255-5694.

It would be helpful if you would return this questionnaire as soon as possible but not later than 24 June 1983 in order to aid in the preparation of the next AMP. Our address is: ASD-AFALD/AXP, WPAFB OH 45433.

1. Please indicate which issues of the AMP you have used. (Check all appropriate blanks.)
Nov 1979 ______ Nov 1980 ______ Feb 1982 ______ Current ______

2. Please check the appropriate items:

military	______	logistics	______	development	______
industry	______	planning	______	marketing	______
manager	______	purchasing	______	marketing	______
worker	______	engineering	______	other	______

How does your job relate to use of the AMP? ______________________________
____
____

3. How many people in your organization do you believe have used one or more issues of the AMP? (Check one blank.)

I am the only user____ Approx 3-5 people are primary users__
Another person is primary user ___ More than 5 people are primary users__
Reference document seldom used ___ Reference document not used ___
Other______ Explain____

4. How many times per quarter do you believe a current issue of the AMP is used in your organization? (Fill in approximate number of times used per quarter.)

1 Oct through 30 Dec ________ 1 Apr through 30 Jun ________
1 Jan through 30 Mar ________ 1 Jul through 30 Sep ________

5. How would a data (PEs, funding, etc.,) delay of one year versus same year effect your use of the AMP?

________ none ________ little ________ significantly

6. How useful are each of the sections of this year's AMP in helping you with your responsibilities? (Please rate each of the following from 0-10, where 0 = Not at all useful and 10 = Extremely useful.)

Chapter One -Introduction
" Two -General Approach/Methodology ______
" Three - Avionics Technology ______
" Four - Logistics Support ______
" Five - Investment Strategy ______
Annex A: Avionics Programs & References ______
" B: Avionics Development Programs ______
" C: Avionics Modification Programs ______
" D: Compendium of Related Plans ______
" E: List of Acronyms, etc. ______
" F: Related Regulations & Standards ______
" G: Test & Support Capabilities ______
" H: Initiatives for Improving Acquisition ______
" I: Electronic Warfare Acquisition Problems & Solutions ______

7. Please check your assessment for future AMP sections.

			Retain	Expand	Delete
Chapter One	-	Introduction	_____	_____	_____
" Two	-	General Approach	_____	_____	_____
" Three	-	Avionics Technology	_____	_____	_____
" Four	-	Logistics Support	_____	_____	_____
" Five	-	Investment Strategy	_____	_____	_____
Annex A:		Avionics Programs and References	_____	_____	_____
" B:		Avionics Development Programs	_____	_____	_____
" C:		Avionics Modification Programs	_____	_____	_____
" D:		Compendium of Related Plans	_____	_____	_____
" E:		List of Acronyms, etc.	_____	_____	_____
" F:		Related Regulations and Standards	_____	_____	_____
" G:		Test and Support Capabilities	_____	_____	_____
" H:		Initiatives for Improving Acquisition	_____	_____	_____
" I:		Electronic Warfare Acquisition	_____	_____	_____

8. Overall, what other additional needs or improvements would you like to see in the AMP? ____

____

____

9. Any other comments? ____

____

____

10. Thank you for your assistance. If desired we will send you a summary of the results of this survey and/or include your office on initial distribution of the next AMP revision. Please provide the information below or to keep the questionnaire anonymous, forward the same separately to the Deputy for Avionics Control, ASD-AFALD/AXP, Wright-Patterson AFB OH 45433.

Name ________________________________

Title ________________________________

Organization ________________________________

Address ________________________________

ZIP ____________

Phone Number ____________

Please check as appropriate

________ Survey Summary ________ AMP Distribution

________ Number of Copies ________ Number of copies

FOREWARD

This Avionics Master Plan (AMP) is the fourth edition of a document which is published annually as directed by AFR 800-28, Air Force Policy on Avionics Acquisition and Support. It supersedes all previous versions of the AMP including the coordination draft dated October 1982. It is the product of inputs from the avionics community and includes comments from the recent coordination cycle and budgetary and program information updates to the draft AMP circulated earlier. The AMP is intended to present a comprehensive view of the current and future direction of USAF avionics for all interested parties in government and industry. Accordingly, it has been widely distributed in the Air Force and is being provided to Defense Technical Information Center (DTIC) for subsequent distribution. Readers are encouraged to provide comments concerning the ways in which the AMP is being used and suggested improvements for future versions. These comments should be directed to the Deputy for Avionics Control, Directorate of Plans and Management Information (ASD/AXP), Wright-Patterson Air Force Base, Ohio 45433. (Autovon 785-5694, Commercial (513) 255-5694).

EXECUTIVE SUMMARY

This is the fourth annual USAF Avionics Master Plan (AMP). It is prepared by the Deputy for Avionics Control as directed in AFR 800-28, Air Force Policy on Avionics Acquisition and Support. The purpose of the plan is to serve as a guide to the avionics community, to focus resources and energies on common goals, and promulgate strategies to move toward the resolution of common problems.

The scope of the plan is broad, ranging from exploratory development to aircraft modification programs. Chapter 1 presents a detailed outlined of the AMP contents. Chapter 2 describes the planning structure applicable to this AMP and provides a summary of avionics needs, acquisition guidelines, and standardization philosophy applicable to USAF avionics. Chapter 3 presents a summary of avionics technology. Chapter 4 discusses logistics support and includes specific avionics related logistics needs. Chapter 5 addresses the subject of investment strategy from a top level avionics perspective. The following paragraphs highlight areas within the AMP which are noteworthy from the standpoint of current emphasis/concerns as well as from a longer range planning perspective.

The strategies reflected in this plan are essentially unchanged from those of a year ago. There is strong continuing emphasis on the effective implementation of the Carlucci initiatives for improving the acquisition process and on steps proposed by Dr. Delauer to improve the electronic warfare acquisition process. Competition and standardization continue to receive strong policy level emphasis, though implementation on a program by program basis remains difficult. Traditional program constraints, such as funding and schedule, make the task of structuring efficient programs difficult. Budget pressures will be a major factor in the effective implementation of the whole range of policy initiatives.

Strong emphasis continues in the avionics program areas of tactical and strategic C^3, electronic combat and target acquisition/recognition from the standpoint of improved near/mid term capability. Programs supporting these areas are proceeding essentially as previously planned, with the exception of tactical C^3. Significant changes are being planned in the approach to achieving jam resistant communications. The alternative architecture to be selected (scheduled for review and approval in the near future) could impact the JTIDS and Mark XV IFF programs as well as SEEK TALK.

A significant challenge lies ahead concerning the effective application of many emerging technologies to new aircraft (ATF/ATB) as well as updates to existing system/subsystems. This challenge will provide the focus for resolution of issues and establishment of trends in the following key technology areas over the next several years.

- VHSIC Development and Acquisition - Including standardization concepts, acquisition strategies and strategies for insertion in existing systems/subsystems.

• Target Recognition/Identification - Including cooperative and non-cooperative system concepts and issues, and ratification of a NATO standardization agreement (STANAG).

• Automation - Includes degree of application to derivative and ATF/ATB, core architecture for ATF/ATB and key areas requiring extensive development and flight validation.

• Survivability - Includes implications of stealth, automation, and requirements for increased spectrum coverage.

• Computer Resources - Includes continued/increased forum activities to evolve new system/subsystem standards; software support issues including software life cycle cost; and language selection/application to various systems (e.g. JOVIAL, Ada).

A trend implicit in all of these emerging technology areas is the movement away from the traditional black box, functional area and organizational concepts that have previously characterized the avionics world. The AFWAL Major Technology Thrust concept is a trend setting approach that recognizes the problems of applying emerging technologies to new and existing aircraft systems.

CONTENTS

CHAPTER ONE

INTRODUCTION OF AVIONICS MASTER PLAN

1.1 SCOPE

The Avionics Master Plan (AMP) has been developed in response to direction given in AFR 800-28, Air Force Policy on Avionics Acquisition and Support.

The AMP is a strategy-oriented document that projects long-range solutions to meet avionics needs. It provides an approach for implementing the broad guidance developed in the Air Force Planning Guide (AFPG), Armament and Avionics Planning Guidance (AAPG) and related approved planning instruments.

The scope of coverage for the AMP as envisioned by AFR 800-28 is extremely broad. The AMP encompasses such areas as Command, Control, and Communications (C^3), Electronic Warfare (EW), Weapon Delivery, Navigation, Computer Resources and Modification Planning. The thrust of the AMP is to assure that all avionics areas, including interfaces with Armament systems, are planned and implemented in concert.

1.2 BACKGROUND

AFR 800-28 establishes policy and assigns responsibility for acquiring and supporting avionics components, equipment and systems. Other regulations and directives also contain policies on acquisition and support and should be used together with this regulation. A compendium of these regulations and standards/specifications is listed in Annex F. Policy expressed in AFR 800-28 has been developed because of several substantial factors influencing avionics acquisition practices:

Increasing cost to support older equipment

Increasing software costs relative to hardware costs

Rapid growth of solid-state digital technology

Technology and threat evolutions forcing early obsolescence of current avionics

AFR 800-28 establishes the need for several key planning instruments for orchestrating the acquisition and support of avionics systems. Examples of these planning instruments are as follows:

<u>AVIONICS PLANNING BASELINE (APB).</u>

<u>Introduction.</u> The APB is designed to display all of the pertinent avionics planning information available on each model of Air Force aircraft that exists or is planned to be in the inventory through FY 1995.

<u>Description of Document.</u> The APB has five categories of avionics information displayed for each Active Duty, Air Force Reserve, and Air National Guard aircraft in the inventory; existing avionics, on-going modifications, other planned avionics, Class IV and V modification funds,

and current Required Operational Capability (ROCs), General Operational Requirement (GORs), and Statements of Operational Need (SONs).

Aircraft Index Sorted By Mission is a listing of Air Force inventory aircraft divided into their respective mission areas. These areas are Attack/Forward Air Controller, Bomber, Cargo/Tanker, Electronic, Fighter, Helicopter, Reconnaissance, and Trainer.

Aircraft Index Sorted by Mission Design Series is a listing of Air Force inventory aircraft divided into their respective Mission Design Series.

Appendix A provides a listing of references used in the generation of the APB.

Appendix B provides a list of abbreivations contained in the APB.

Appendix C is a listing of the OPR's and other points of contact for developing detailed information for specific aircraft and avionics systems.

Appendix D presents avionics equipment nomenclatures sorted by functional and subfunctional area. The functional areas are: Communication, Controls and Displays, Electromagnetic Combat, Flight Controls, Identification, Navigation, Reconnaissance, Systems Integration, and Target Acquisition/Strike.

Appendix E is an alphanumeric list of each piece of avionics equipment. The description, function, aircraft installs and status are shown for each nomenclature. These nomenclatures are organized by functional area. Also shown are the Air Logistics Centers points of contact.

Appendix F lists avionics equipment by functional area and shows how many aircraft installations there are for each equipment, functional and subfunctional area. The totals are shown for existing equipment and future equipment. The installations are based upon the force structure (1982) of the aircraft and the equipment quantity per aircraft.

Appendix G displays avionics-related Class IV and V modification programs (P-1100 funds in millions of dollars). Funding data was taken from the Aircraft Modification Funding Plan, P3X Report and the AFLC G079 data system. Equipment which is being installed or being modified is shown with the equipment nomenclature, functional area and number of current installations.

Appendix H lists all avionics research and development programs in order of Program Element (PE). Research, Development and Test and Evaluation (Appropriation P-3600) funds are categorized by Exploratory Development (PE 62XXX), Advanced Development (PE 63XXX), and Engineering Development (PE 64XXX). Three sources of funding information are shown for each project: Five Year Defense Plan (FYDP); Program Objective Memorandum (POM) and Budget Estimate Submission (BES).

The Armament and Avionics Planning Conference (AAPC). The AAPC brings together users, technologists, and logisticians in an open forum to consider avionics solutions to identified deficiencies and to address technical and policy initiatives and issues in the avionics and armament

areas for inclusion in a document for command coordination. AAPC activities are conducted primarily through avionics standing panels and an Executive Group (EXCOM) consisting of selected individuals with extensive experience in the avionics and armament areas. Functional areas covered by the three standing panels and reviewed by the EXCOM include Combat Effectiveness, Standardization and Availability.

Armament and Avionics Planning Guidance (AAPG). The AAPG document summarizes the recommendations of the Armament and Avionics Planning Conference (AAPC). The purpose of the AAPG is to provide armament and avionics planning alternatives, based on the conference proceedings, from which the current guidance and specific policy regarding Air Force armament and avionics system development, acquisition, and support will emerge. This document is updated annually by AAPC activities to reflect changes in emphasis resulting from new direction, threat developments, and other armament and avionics planning initiatives. This guidance applies to the entire armament and avionics planning and support process: technical, managerial, and operational; however, material in this document does not supersede existing regulations, directives, or procedures. Implementation of the recommendations in the AAPG is likely to require new programs, cancellation or modification of old programs, capital investment, and management changes.

1.3 FORMAT

Subsequent sections of the AMP are:

a. Chapter 2, General Approach/Methodology, provides a planning framework and broad guidance applicable to USAF avionics. Specific areas addressed include a planning structure applicable to the AMP planning effort, objectives, acquisition guidelines and standardization.

b. Chapter 3, Avionics Technology, provides a summary discussion of seven major avionics technology areas. They are Microelectronics; Radar; Electro-Optics; Electronic Warfare; Communications Navigation and Identification; System Integration, Analyses and Software; and Avionics Logistics Support.

c. Chapter 4, Logistics Support, discusses current and projected directions of Logistics Support for avionics including logistics needs.

d. Chapter 5, Investment Strategy, presents a top level investment strategy for avionics.

The Annexes contain a variety of information and supporting material as described below:

a. Annex A, Avionics Programs and References provides an alphabetical listing of all avionics developmental/modification programs.

b. Annex B, Avionics Development Programs, lists all avionics development programs by number, description, and major milestones.

c. Annex C, Avionics Modification Programs, describes all avionics modification programs by number, installed/projected aircraft, equipment title, and schedule/quantity for installation.

d. Annex D, Compendium of Related Plans, presents a digest of plans which are related to the avionics area or programs which are common to the avionics area.

e. Annex E, List of Acronyms, Abbreviations and Code Names, lists and explains acronyms and abbreviations used in the AMP.

f. Annex F, Related Regulations and Standards/Specifications, contains an avionics related regulations and standards/specification listing that can be used to provide further direction in avionics development and modification.

g. Annex G, Test and Support Capabilities, provides summary descriptions of Air Force and national test and support facilities applicable to avionics.

h. Annex H, Initiatives for Improving the Acquisition Process, lists the major acquisition policy changes announced by Deputy Secretary of Defense Frank Carlucci on 30 April 1981.

i. Annex I, Electronic Warfare Acquisition Problems and Solutions, discusses the EW acquisition problems and solutions which were outlined in a 19 June 1981 memorandum issued by Dr. Richard DeLauer, under Secretary of Defense for Research and Engineering.

CHAPTER TWO

GENERAL APPROACH/METHODOLOGY

This chapter will present a top level perspective of the avionics planning framework applicable to this AMP as well as general objectives and guidelines pertinent to avionics planning and acquisition. Specific areas to be addressed include planning structure, objectives, acquisition guidelines and standardization.

2.1 PLANNING STRUCTURE

The purpose of this section is to define the planning structure applicable to this AMP. The planning structure is best described by the current mission area framework as well as a functional area breakout of avionics. Table 2-1 relates AFR 57-1 mission areas to the AFSC POM cycle. Table 2-2 defines the avionics functional area breakout and shows the relationships between the avionics functional areas, the Air Force Wright Aeronautical Laboratory (AFWAL) Major Technology Thrusts, the AFWAL Avionics Technology Thrusts and the mission areas previously described. The functional group (subfunctional area) column in Table 2-2 provides a more detailed description of the types of subsystems which fall within each functional area. Table 2-3 summarizes avionics programs (current FYDP) which fall within and support the avionics functional areas and thrusts shown in Table 2-2. These programs are related to applicable avionics objectives in paragraph 2.2. below and are described in more detail in Annex A through C. Table 2-3 also includes a reference to related AAPC issues and related plans. The AAPC issues shown in this draft AMP are taken from the 1981 AAPC and are described in detail in the December 1981 AAPG. The planning structure outlined here and the programs shown in the annex represents the departure point for strategy considerations in Chapter 5 and subsequent changes in future POM cycles.

The functional area breakout shown in Table 2-2 was selected to address the full spectrum of avionics from currently fielded subsystems to subsystems currently in engineering development or production to technology base programs. This structure also provides some harmony with other institutional/planning activities which overlap the avionics area. For example, C^3 and Electromagnetic Combat are supported by separately established institutional planning activities to a high degree. An attempt will be made to maintain the AMP planning structure so that related planning efforts such as C^3 plans, Electromagnetic Combat Action Plans (ECAP), etc., are clearly visible and support/complement the AMP planning effort.

An examination of the technology base programs will show a trend away from traditional, functional boundaries such as communications, navigation, identification, flight control, ECM, propulsion, etc. These trends are best illustrated by such programs as PAVE PILLAR (63253), AFTI/F-16 (63205, 63245), VHSIC (63452), and stealth techniques which address system level materials and shapes as well as reduced observable emissions from avionics subsystems. The avionics planning structure in this AMP will change over time to better accommodate these emerging system/subsystem concepts and to better reflect new areas of emphasis.

(U) TABLE 2-1 MISSION AREAS

Mission Area (AFR 57-1)	POM Mission Area
100 Strategic Warfare	
110 Strategic Offenses	
113 Airborne Strike	Strategic Offense (S/O)
120 Strategic Defense	
122 Strategic Air Defense	Strategic Defense (S/D)
140 Strategic Support	Defense Wide (D/W)
200 Tactical Warfare	
220 Air Warfare	
221 Counter Air	Counter Air (C/A)
223 Close Air Support and Bottlefield Interdiction (CAS/BI)	Air-to-Surface (A/S)
224 Defense Suppression (DS)	D/S
225 Air Warfare Support	Mobility (MOB)
227 Air Warfare Surveillance and Reconnaissance	Reconnaissance/Intelligence (RI), C^3
228 Intra Theater Airlift	MOB, C^3
260 Strategic Mobility	MOB, S/O
261 Intertheater Airlift	MOB
300 Intelligence, Communications, Command and Control (C^3I)	
310 Centrally Managed Intelligence	
311 Consolidated Cryptologic Program	C^3
320 Tactical Intelligence and Related Activities (TIARA)	
321 TIARA for Strategic Warfare	RI
322 TIARA for Tactical Land Warfare	RI
324 TIARA Capabilities Development	RI
327 TIARA for Tactical Air Warfare	
330 Strategic C^3 Programs	
331 Strategic C^2	C^3
332 Strategic Surveillance and Warning	C^3
333 Strategic Communications	C^3
334 Strategic Information Systems	C^3
340 Theater and Tactical C^3 Programs	
341 Theater C^2	C^3
342 Surveillance and Reconnaissance	C^3, RI
343 Theater Communications	C^3
344 Tactical C^2	C^3
345 Tactical Communications	C^3
350 Warfare Command and Control	
352 Air Warfare	C^3
356 Mobility	C^3
360 Defense-Wide C Program Support	
361 Navigation and Position Fixing	C^3, A/S
363 Common User Communications	CA, C^3
364 COMSEC	C^3
370 EW & C^3 Countermeasures	
371 Self-Protection	D/S, S/O
372 Escort, Stand-Off and Counter C^3	D/S

373 Tactical Surveillance, Reconnaissance and Target Acquisition	
374 Multimission, Technology and Support	Technology Base (TB), RI, CA, AS, DS
400 Defense-Wide Mission Support	
420 Global Military Environmental Support	MOB
430 Non-System Training Devices	DW
440 Technical Integration/Studies and Analyses	TB, SO, AS, CA, C^3, RE
450 Test and Evaluation Support	
451 Major Ranges and Test Facilities	DW
453 Joint Test and Evaluation	DW, SO, AS, CA, C^3
454 Other Test and Evaluation Support	DW
460 International Cooperative RDT&E	AS, CA, C^3
470 Management Support	
471 General Management Support	AS, DW
472 R&D Future Options	TB
473 Defense System Cost-Effectiveness/ Improvement	DW, TB, AS, CA, SO, C^3
480 Production Base Support	DW, TB
500 Science and Technology Program	
520 Exploratory Development (ED)	
521 Electronic and Physical Sciences (ED)	TB
523 Engineering Technology (ED)	TB
530 Defense Advanced Research Projects Agency	TB, AS
550 Advanced Technology Demonstration (ATD)	TB, AS, CA, C^3, RI, DS, SO
552 Environmental and Life Sciences	TB
553 Engineering Technology	TB

TABLE 2-2

AVIONICS PLANNING STRUCTURE

MAJOR CATEGORY	FUNCTIONAL AREA	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	FUNCTIONAL GROUP (SUBFUNCTIONAL AREAS)	RELATED MISSION AREAS POM	RELATED MISSION AREAS AFR 57-1
COMMON (C)	COMMUNICATIONS (C)	NIW SSP	ME CNI SI LS	VOICE (V) DATA LINK (DL)	C^3, TB	331, 333, 334, 122, 311, 341, 343, 344, 345, 364
	NAVIGATION (N)	NIW SSP	ME SI CNI LS	RADIO (R) SELF CONTAINED (SC)	AS, CA, SO MOB, TB	361, 260, 261, 221 113, 122, 223, 225
	IDENTIFICATION (ID)	NIW SSP	ME EO RA CNI SI LS	COOPERATIVE (COOP) NON-COOPERATIVE (NC)	CA, TB, C^3	221, 223, 113, 122, 332, 227
CORE (CO)	SYSTEM INTEGRATION (SI)	NIW SSP SG	ME LS CNI SI	CENTRAL PROCESSING HARDWARE (CP) EXECUTIVE SOFTWARE (SW) INFORMATION TRANSFER (MULTIPLEX SYSTEMS) (MUX)	AS, CA, SO, MOB, TB	ALL
	CONTROLS AND DISPLAYS (CD)	NIW SSP SG	ME LS CNI SI	MULTIFUNCTION DISPLAYS (MFD) SINGLE FUNCTION DISPLAYS (SFD) INSTRUMENTS (IN)	AS, CA, SO, MOB, TB	ALL
	FLIGHT CONTROL (FL)	NIW SSP SG	ME SI LS	CONVENTIONAL SYSTEMS (CON) INTEGRATED FLIGHT/FIRE CONTROL SYSTEMS (IFFC) FLIGHT MANAGEMENT/FUEL ADVISORY SYSTEMS (FSAS)	AS, CA, SO, MOB, TB	ALL
MISSION (M)	ELECTROMAGNETIC COMBAT (EC)	NIW SSP	ME LS EO RA EW SI	C^3 COUNTERMEASURES (C^3CM) SUPPRESSION OF ENEMY AIR DEFENSES (SEAD) ELECTRONIC WARFARE (EW)	CA, AS, SO, TB, DS	224, 371, 372, 373, 374
	TARGET ACQUISITION/ STRIKE (TA/S)	NIW SSP SG	RA LS ME EO ST SI	RADAR (RA) INFRARED (IR) ELECTRO-OPTICAL (EO) COMBINED SENSORS/INT SUBSYSTEM (CSIS)	CA, AS, SO, TB, RI	113, 122, 221, 223
	RECONNAISSANCE (RE)	NIW	RA LS ME EO SI	RADAR (RA) INFRARED (IR) ELECTRO-OPTICAL (E/O) COMBINED SENSORS/INT SUBSYSTEMS (CSIS)	RI, TB	227, 321, 324, 327, 332, 342, 373

TABLE 2-3

AVIONICS PROGRAM/PLANNING ACTIVITY SUMMARY

MAJOR CATEGORY	FUNCTIONAL AREA	EXPL. DEV 6.2 (APP B)	ADV DEV 6.3 (APP B)	END DEV 6.4 (APP B)	CLASS V MODS (APP C)	CLASS IV MODS (APP D)	RELATED AAPC PANEL/ISSUE	RELATED PLAN (ANN D)
	COMMUNICATIONS (C)	62702/2338* 4519 62204/7662	63789/2478 63203/69CK* 63244/2251 63253/2538 63431 63727	41840 64201/2257* 33131 64616/ 2727 33601 64711/3763*	2784 3025 3050 2907 3063 3070 3044 3064 3125	11010C 68027A 16623C 68098B 17612C 69023A	CEP 82-1* SP 82-5 SP 82-7 SP 82-9	C^3 TPG, A-J Comm, TAFIIS, USAFC^3
COMMON (C)	NAVIGATION (N)	62204/6095	63203/666A 63253/2538	64778 65708/688G	2048 2984 3048 2917 3023 3033	10513B 11622B 16622B 15411B 10611C 13606C 17305A 19201B 11304B 16405B 18246B 19304B 36068C 60067B 68025C 68098B 19501B	CEP 82-3 SP 82-4 SP 82-5 SP 82-8 AP 82-2* AP 82-3*	MK XII TIP USIS
	IDENTIFICATION (ID)		63253/2538 63742	64725	2998		SP 82-5	
	SYSTEM INTEGRATION (SI)	62204/2003 62702/7581	63226 63253/2734 2735 63452* 63726, 63735 63728 63106/2940	71112 64201/2297 2560 2658 2771 2773 64247 64740, 2123 2524 2526 2652 64733/2873	3023 3060	41652B	AP 82-1 SP 82-1* SP 82-2* SP 82-10 SP 82-11	ISAS A2I2
CORE (CO)	CONTROLS AND DISPLAYS (CD)				3023 3087 3089	10603A 68098B 16419B 19607A 19608A	SP 82-6 CEP 82-4	PMPs*
	FLIGHT CONTROL (FL)	62201/2403	63205/2506 63245/2061	64201/2772		10402B 11608A 13315A 18420B		AFWAL Inc. Cont.
	ELECTROMAGNETIC COMBAT (EC)	62204/2000 7633 2002 6096 7633 62702/4519	63718 63743 63750 63749	64220 64710/2501 64724 64735 64737 27136 64738 64739 64742	2900 2970 3034 2923 2973 3008 2930 2981 3010 2952 3088 3113 2960 3068 2957 3015	10349C 10613B 18607B 39043B 69074B	CEP 82-2 SP 82-3	ECAP, AFSC Conspectus* Vanguard* Threat Assessments*
MISSION (M)	TARGET ACQUISITION/STRIKE (TA/S)	62204/2001 6096/7622 2002 7629 2004 62702/ 4600 4506	63103 63750 63203/69DF 2733 63211/ 2100 63249 63726 63747	64201/2259 2519 64212/ 4366 64249 65708/2900 64616/2814 2727	2916 3022 2951 3035 2974 3013	10310B 18501B 11602B 19611B 16509B 61050B 18316B 18317C	AP 82-4* AP 82-5*	MSIP* TN* TPG* ART,
	RECONNAISSANCE (RE)	62204/2004 7622 7662 6096 62702/ 4506 4594 4600	63103 63203/ 2733 63208/665A 63239 63727/ 2345 63726	64710 64747/ 1209* 64756	2707 3011 2871		AP 82-6	PMP* POM* AFPG*

*APPLIES TO ALL FUNCTIONAL AREAS

2.2 OBJECTIVES

This section will present a summary of the capability objectives which must be met through avionics enhancements. A broad outline of these objectives is shown in Table 2-4 along with implied solutions applicable to each objective. The major objective is to achieve improved combat effectiveness. A closely related objective is to obtain sufficient funding in current and future budgets. This will be necessary to achieve an adequate level of combat effectiveness. A third major objective is to achieve and maintain an optimum schedule for avionics programs. This schedule objective has become increasingly important over time because of the growing threat as well as the economies which can be achieved by minimizing the number of delayed and stretched programs. An optimum schedule is also dependent upon funding sufficiency.

Table 2-5 presents a more detailed summary of avionics objectives along with related technology thrusts and programs which address each objective. The "AFWAL Major Thrust" Column shows related major system level technology initiatives within AFWAL which are supported by applicable 6.2 and 6.3 avionics programs and which share the avionics objectives shown. The major thrust which draws most heavily on avionics program support is Night-InWeather (NIW) Attack. Other major thrusts which share avionics objectives include Sortie Generation (SG) and Supersonic Persistence (SSP). Each major thrust draws support from the Materials, Flight Dynamics, Propulsion and Avionics Laboratories to achieve system level technology advances with planned technology availability in the FY 86-88 period. The "Avionics Technology Thrusts" are primarily avionics laboratory efforts, though not exclusively. These thrusts are discussed in detail in Chapter 3 and cover the following seven major avionics technology areas: Micro-Electronics (ME), Radar (RA), Electro-Optical (EO), Electronics Warfare (EW), Communications-NavigationIdentification (CNI), Systems Integration, Analysis and Software (SI) and Logistics Support (LS). The related avionics programs shown in Table 2-5, cover the full spectrum from exploratory development (6.2) to modification programs. The programs in Table 2-5 provide an unspecified level/degree of improvement toward meeting the related objective. These programs are managed within all of the laboratories, product divisions and ALCs throughout the Air Force. More detailed information on the programs (including points of contact) is shown in Annex A through C.

2.3 ACQUISITION GUIDELINES

Avionics acquisition strategy includes all of the policies, procedures and planned activities related to the total Government and Contractor effrot to qcquire avionics. The specific acquisition strategy employed will vary on a program by program basis. The acquisition guidelines discussed here are general in nature and are intended to provide a framework for establishing effective strategies for acquiring avionics. Areas of major emphasis include cost effectiveness, competition, and current acquisition philosophies/constraints.

2.3.1 COST EFFECTIVENESS

The objective of improved cost effectiveness is being emphasized as a matter of policy. It is being pursued through a number of initiatives for broad appliation to many programs as well as through cost study efforts and contractual incentives tailored to specific programs.

GENERAL OBJECTIVES VS IMPLICATIONS

OBJECTIVES	IMPLICATIONS
COMBAT EFFECTIVENESS	
o CAPABILITY	
o ALL ENVIRONMENT o ACCEPTABLE PILOT WORKLOAD o MULTIPLE KILLS PER PASS	o IMPROVED SUBSYSTEM PERFORMANCE o IMPROVED SYSTEM/ SUBSYSTEM INTEGRATION
o INTEROPERABILITY	
o COMMUNICATIONS o COOPERATIVE NAVIGATION o COOPERATIVE IDENTIFICATION	o RATIONAL STANDARDIZATION
o SORTIE GENERATION	o AVAILABILITY o SUPPORTABILITY o FAULT TOLERANT AVIONICS o GRACEFUL DEGRADATION
o SURVIVABILITY	o SYSTEM/SUBSYSTEM HARDENING o REDUCED OBSERVABLES o ENHANCED SUBSYSTEM

TABLE 2-4

	PERFORMANCE (EW, SEAD, C3CM) o SYSTEM AUTOMATION o LOW LEVEL TACTICS o REDUCED CREW WORKLOAD
FUNDING SUFFICIENCY	
o UNCONSTRAINED	o COMBAT EFFECTIVENESS LIMITED ONLY BY TECHNOLOGY AND MANAGEMENT EFFECTIVENESS
o CONSTRAINED	o DELAYED TECHNOLOGY AVAILABILITY AND IOC o LESS THAN OPTIMUM SYSTEM/SUBSYSTEM EFFECTIVENESS o LESS THAN OPTIMUM PRODUCTION QUANTITIES/RATES
OPTIMUM SCHEDULE	o TIMELY THREAT/TECHNOLOGY ASSESSMENT o FUNDING SUFFICIENCY o EARLY RESOLUTION OF KEY ISSUES o TIMELY TECHNOLOGY AVAILABILITY/TRANSITION o P^3I CONCEPTS FOR EFFICIENT RETROFIT/GROWTH

TABLE 2-4 (CONT.)

TABLE 2-5

AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
COMMUNICATIONS						
Interoper-ability				63735/2188 63789/2478 63431/12029	27423/2614 64779 64754 33144 27417	3042
Jam Resistance	CNI ME	62204/7662 62702/4519	63727/2746 63253/2538 62702/4600	27423/2277 33601/2478 63727/2748 63431/1227 63735/2188 63452	3064 (HAVE QUICK) 33603 3313/2833 27423/2614	
Secure Voice Communications	CNI ME		63735/2188	33401	3025 3070 (VINSON) 3063 (PARKHILL)	
Improved Stealth				63727/2746 63727/2747		
Beyond LOS Connectivity			62702/4519	63727/2748	33603 33601/2478 33131/2833 33131/2832 11312/2211 11312/2212	2784 2907

TABLE 2-5

AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
EMP Resistance		CNI ME	62204/7662	63727/2747	64711/2485 11312/2211 11312/2212 33131/2833	
Improved Data Links		CNI ME	62204/7662 62702/4519 62702/4594	63727/2345 63253/2538	64754 64606/2802 64742/1190 64616/2727	
NAVIGATION						
Autonomous Capability	NIW	CNI	62204/6095	63203/666A	11113/2406 27136 27131 27133 64249	2984 3023
Improved Position Accuracy	NIW	CNI	62204/6095	63203/666A	64778 64249 1113/2406 27136	2984 3023 3303
Precision Low Level Navigation in Night/In-Weather Conditions	NIW	CNI	62204/6095 62201	63249 63203/2733 63203/666A	27131 27133/2671 27130/2858 11113/2406 11113/2571	3023 3303

TABLE 2-5

AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100
					11113/2601 11113/2692 64249 64201/2579 64226 64753	
Improved ECM Resistivity and EMP Hardness of Cooperative Navigation Systems		CNI	62204/6095 62702/2338	63203/666A	64778 35114/2026 35114/2759 64711/2485	
IDENTIFICATION						
Improvement to existing IFF Systems				64725/2463	CLS IV	
Automatic detection and identification	NIW	ME, SI RA, EO	62204/2001 62204/2004 62204/7622 62204/7629	63742/1177 63249 63747 63203/2733 63203/69DF 63103 63203/69CK 63452 63208/665A 63742/2599	64201/2519 64725/2597 11113/2601 64226 64249 64710/2337 27130 64710/2660 64756/2037 27133 64725/2598 64725/2751 64725/2778	
New IFFN Subsystems for Mid/Far Term Capability				63742/1177 63742/2599	64725/2598 64725/2597 64725/2751 64725/2778	

TABLE 2-5

AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	EXP. DEV. (6.2)	RELATED PROGRAMS ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
Interoperability				63742/2599	64725/2598	
Longer Range Target SSP Identification		ME, SI RA, EO	62204/2004 62204/7622 62204/7629	63747 63103 63203/2733 63742/1177 63742/2599 63452	64710/2660 27130 27133/2671 64201 /2519 64725/2597 64725/2598 64725/2751 64725/2778	
CONTROLS AND DISPLAYS						
Advanced display and real-time graphic software to support effective crew/system interface	NIW	SI	62204/2003	63253/2734 63253/2735 63205/2506 63245/2061 63452		
Optimum format, brightness and contrast	NIW	SI	62204/2003	63205/2506 63245/2061 63253/2734 63253/2735	27133/2835 27130/2858 11113/2405 64226	3023 3087

TABLE 2-5 AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
Optimum utilization of cockpit real estate	NIW	SI	62204/2003	63253/2734 63253/2735	27133/2835 27130/2858 1113/2405 64226	3023 3087
Reconfigurable controls and displays to satisfy mission needs	NIW	SI	62204/2003	63205/2506 63245/2061	27133/2835 27130/2858 11113/2405 64226	3023 3087
Intuitive presentation of distilled information	NIW	SI	62204/2003	63253/2734 63253/2335		
Integrated Architecture	NIW	SI	62204/2003	63253/2734 63253/2735	11113/2405 11113/2406	3087 3023
SENSORS						
Target detection at increased range and improved angular accuracy	NIW	ME, RA EO	62204/7622 62204/7629 62204/2004 62204/2002	63747 63103 63203/2733 63203/69DF	64710/2660 27130 27133/2671 64201/2519 64742/1190 64616/2814 64226 11113/2601	2917 2974 3013 2707

TABLE 2-5

AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	RELATED PROGRAMS ADV. DEV (6.3)	RELATED PROGRAMS ENG. DEV. (6.4)	MOD (3010 P1100)
Improved ECM/EOCM resistance	NIW	RA, EO	62204/2001 62204/2004 62204/6096 62204/7622 62702/4506	63750/2334 63750/2347 63452 63743/431G 63743/2222 63211/2100 63747	64201/2519 27130 27137/2671 64226 11113/2601	
Increased firing opportunities (multiple targets) and accuracy for air-to-air missiles	SSP	RA, EO	62204/2004 62204/7622 62204/7629	63203/69DF 63203/2733 63452 63742	64201/2519 27130 27133/2671 64725	
Multiple target acquisition and tracking; multiple kills per pass for air-to-ground attack	NIW	RA, EO ME, SI	62204/2004 62204/7622 62204/7629	63208/665A 63203/69DF 63203/2733 63103 63452 63747 63742 63253/2734 63253/2735	64201/2519 64249 64710/2660 27130/2858 27133/2671 27133/2835 64616/2814 64725	
Broader spectrum coverage	NIW	RA EO	62204/2001 62204/2002 62204/2004 62204/7622 62204/7629	63103 63203/69CK 63203/69DF 63203/2733 63208/665A 63747 63239 63249	64201/2519 64249 64710/2337 64710/2660 64756/2037	2707 2871 3011

TABLE 2-5 AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
Improved night/	NIW	RA,EO	62204/2004	63203/69CK	64249	2917
in weather target		ME,SI	622204/7622	63203/69DF	64201/2519	2974
detection/identifi-			62204/7629	63203/2733	64616/2814	3013
cation/tracking			62204/7629	63203/2733	64616/2814	3013
			62102	63249	64226	2707
				63103	27133	
				63452	27130	
				63747	64725	
				63742	64756/2037	
				63239	64710/2660	
Improved sensor	NIW	ME, RA	62204/2001	63452	64201/2519	2917
integration/signal		EO, EW	62204/2004	63203/2733	64249	2974
processing		CNI	62204/6096	63250	27130	3013
			62204/7622	63208/665A	27133/2671	3023
			62204/7629	63253/2538	64226	2707
			62204/7633	63253/2734	11113/2601	
			62702/4600	63253/2735	64725	
			62702/4594	63718/691X	64756/2037	
			62102/2423	63718/2432	64616/2814	
				63718/2754	64710/2337	
				63728	64710/2660	
				63742		
				63239		
				63747		

TABLE 2-5 AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
SORTIE GENERATION						
Improved reliability	NIW	LS	62204/2003 62204/6096 62702/2338			78026
Improved supportability	NIW	LS	62204/2003 62702/5581	63728/2532 63253/2734 63253/2735	78026 64740/2523 64201/2560 64740/2526	
Rational standardization	NIW	SI, LS	62204/2003	63253/2734 63253/2735 63253/2538	64740/2652 64201/2257 64201/2658 64201/2560 64201/2771 64201/2297 64201/2519	
Capability for design of very low maintenance flight control systems (60% reduction in MMH/FLT HR relative to F-16)	SG		62201/2403			
Fault tolerant system architecture available to lessen dependency on SE (3 to 5X increase in reliability relative to current fighter systems)	NIW SG	LS, SI	62204/2003	63253/2734 63253/2735		

TABLE 2-5 AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	EXP. DEV. (6.2)	RELATED PROGRAMS ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
Capability for precise autonomous visual/ instrument landings	SG	RA, EO SI				
Integrated flight/ propulsion control to permit 20% reduction in touchdown speed relative to F-16	SG	SI	62201			
Airborne sensor capable of detecting small craters (less than 1 ft)	SG	EO				
SURVIVABILITY						
Improved electronic circuits hardening	SSP	ME, RA EO	62204/6096 62702/4600	63203/69CK 63205/2507 64711/2485	11113/2548 64711/3763	
Reduced DEW vulnerability to E-0 sensors	SSP	EO, ME	62204/7633 62204/2000 62201/2402 62102/2419	63211/2100		
Improved lightening protection	SSP	ME, RA EO	62204/6096 62702/4600	63205/2507	11113/2548 64711/3763 64711/2485	
Rain erosion resistant FLIR window coatings	SSP		62101/2419 62102/2423		78011	

TABLE 2-5

AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
Decreased threat sensor detection range						
Reduced sensor observables (emissions)	NIW	RA, EO EW	62204/7633 62204/2000	63726/2746 63203/2733		
Reduced vehicle observables (RCS, IR, Visual and UV)	SSP NIW SG	EW	62204/7633 62201/2401 62201/2404 62102/2419 62102/2422 62204/2001	63244 63211/69CW 63202 63216 63718/691X 63743/431G 63743/431G		
ECM/EOCM resistant systems/subsystems	NIW	EW, ME	62204/6096 62102 62201 62204/2000 62204/7633	63750/2334 63750/2335 63750/2347 63747 63211/2100	64201/2519 64756/2037	

TABLE 2-5 AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
Ease of threat reprogramming		EW	62204/7633	63718/691X 63718/2432	64738 64739	
Threat adaptable systems/subsystems	NIW	EW	62204/7633	63718/2432	64738 64739	
Improved C^3 CM		EW	62702/4519 62204/2000	63718/2754 63718/691X 63452	64724/2462 64724/2677 64724/2726 64742/1190	
Threat prioritization		EW	62204/7633	63718/2432	64738 64739	
Improved threat suppression	NIW	EW	62204/2000	63718/691X	27136 64742	
Increased survivability from improved expendables	SSP NIW	EW	62204/2000	63743/431G	64739/2274	2900 2981 3004

TABLE 2-5

AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
Improved threat detection (higher densities from radar, microwave, optical, IR frequencies)	SSP	EW	62204/7633 62204/2001 62204/2002 62702/4519 62204/2000	63718/2432 63452 63743/431G 63743/2222 63718 691X	64737 64738 64739 64742/1190 27136	
Increased surviv-ability from longer duration, higher output, aero stabilized pyro-phoric flares	SSP	EW	62204/2000	63743/431G		
Improved E-O threat detection		EW	62204/2001 62204/7633	63452 63743/431G 63743/2222	64738/3829 64739/2274 64710/1155	
High performance, self sufficient power for EW	SSP	EW				
Near term EW enhancements					64738 64739 64220	2900 2960 2923 2970 2930 2973 2952 2981 2957 3004 3010 3008 3015 3068 3118 3088

TABLE 2-5 AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	RELATED PROGRAMS ADV. DEV. (6.3)	RELATED PROGRAMS ENG. DEV. (6.4)	MOD (3010 P1100)
SYSTEM INTEGRATION						
Increased crew/ system effective-ness	NIW	SI	62204/2003	63253/2734		
Selective Automation			62201/2404	63245/2061 63205/2506 63253/2734	27133 27130 11113/2405 11113/2406	3023
Increased sur-vivability during penetration and weapon delivery	NIW	EW, SI ME, RA EO, CNI	62201/2403 62201/2404 62204/2000 62204/7633 62204/7622 62204/2004	63253/2734 63103 63718 63743	27133 27130 11113/2406	3023
Integrated TF/TA			62201/2403	63253/2734 63253/2735		
Integrated navigation	NIW SG	CNI, RA SI, EO	62201/2404 62204/6095	63253/2734 63253/2735 63203/666A 63253/2538	27133 27130	3023

TABLE 2-5 AVIONICS CAPABILITY OBJECTIVES

CAPABILITY	AFWAL MAJOR THRUST	AVIONICS TECHNOLOGY THRUST	RELATED PROGRAMS EXP. DEV. (6.2)	ADV. DEV. (6.3)	ENG. DEV. (6.4)	MOD (3010 P1100)
Optimal flight trajectory with EW integration	NIW	SI, CNI, EW, RA, EO	62201/2404	63253/2734 63253/2735	27133 27130	
Integrated CNI Avionics	NIW SSP	CNI	62204/7662	63253/2538		

Improved cost effectiveness is a major objective being pursued in avionics technology base programs, since life cycle cost is largely determined early in the development phase of programs. Cost effectiveness is the primary objective underlying the emphasis on competition as well as other areas of current emphasis.

To achieve improved cost effectiveness, we must make realistic cost predictions through the use of refined Life Cycle Cost (LCC) models using dynamic simulation techniques, more current and accurate data, and better program definition. We must consider the benefits of cost reductions based on traditional cost-quantity discount relationships versus competitive (split-buy) concepts. We must evaluate deployment and support concepts including number of bases, locations, maintenance concepts, reliability improvements, and software support for these alternatives. We should define optimum cost effective approaches by using operations research and systems analysis techniques which evaluate cost, technical approach, and other information. It is essential that the total LCC impact be considered when comparing program approaches/contractors' products.

A specific example where total LCC impact has become increasingly important lies in the area of integrated avionics. Total LCC must be considered early on for both hardware and software. A problem frequently arises when LRU/SRUs designed to be hardware common (or nearly so) are produced on one production line, may have a single manufacturer's part number but are produced without software. When EPROM software is added, the item can usually be treated as common. However, this requires a maintenance plan which allows for erasure of the software when the item is to be returned to a common bin for reissue. The requisitioner must also be equipped to rapidly reprogram the item upon receipt. If the software added is not erasable/reprogrammable, the various end item applications will be given separate part numbers because they are no longer interchangeable and must be separately controlled. Thus, a hardware item which appears to be common actually becomes peculiar in the inventory. In many cases, this could be precluded by simply buying erasable/reprogrammable software. However, the cost of EPROM versus ROM or PROM software is considerably greater. Consideration of the type and effect of software technology should be made up front so that life cycle cost comparisons can be made and the final decision justified.

There are a number of initiatives within the avionics community which support the objective of improved cost effectiveness. The Computer Resources Panel initiated as series of actions within AFLC and AFSC to establish a standardization methodology for software cost estimating (SCE) and for gathering data necessary to support SCE. These actions included coordination with other users of embedded computers (i.e., Communications Electronics, Aircrew Training Devices and Automatic Test Equipment Community) to consider their interests in SCE, establishing a list of SCE model input parameters and validation of standardized SCE models using data from software development projects. Project managers should track these actions closely to assure that software development projects derive benefit from the actions as well as contribute to the data base for SCE model validation.

A requirement exists within the avionics acquisition and support communities to develop a simple estimating relationship to calculate roughly the expected logistics effects of differing choices during detailed design. During the detailed design process, the design engineer must make selections of which item to use. While he would like to consider the eventual logistics costs in his decision, he needs to make a fast decision and move on to the many hundreds of other components he must select for the design. Presently, it is unlikely he would use a complex model such as the Logistics Support Cost (LSC) model and would instead make a judgement based on experience. The models available are complex and require large amounts of input data. What is need are simple Logistics Estimating Relationships (LERs) that allow quick evaluation of future logistics impacts. The estimates should be structured so that the very general logistics design characteristics used for Milestone 0 could be expanded and refined without losing their logic and consistency in Phase I of the design process. Action is being planned to: evaluate all available data for potential application; interview design engineers to determine their views on the type and structure of the LERs; develop a set of relationships for a specific system or subsystem under design; and have design engineers apply these relationships on a pilot basis to a specific design. This process will help the design engineers determine the effectiveness of the selected relationship in aiding the design decisions. In addition, methodologies must be developed to evaluate impacts of weapons systems design considerations on future logistics costs to provide more timely analyses and eventual Operations and Support (O&S) cost reduction. Designers and logsiticians should monitor progress on this initiative and make contributions to the development of simple LERs for use on future programs.

A goal programming model has been developed at ASD as a decision aid in ranking proposed avionics programs. This model is necessary because there is no systematic, mutually acceptable approach for determining which standardization programs provide the most leverage per dollar invested. Additionally, there is no overall standarization investment strategy which is sensitive to various levels of funding (i.e., the current austere level, a higher more cost effective level or a still higher level which meets MAJCOM requirements). The impacts of not having the programming model are: (1) schedule delays awaiting issue resolution; (2) on-going uncertainly concerning what constitues rational standardization; and (3) poor communications between user and standardization advocates. The model will provide a structured and more consistent approach to judging the relative merits of each individual program. The model has been developed and is being tested with sample data from several mission areas. A validation phase was conducted during the FY 1983 POM prioritization process at ASD in December 1980. Initial runs show reasonably good correlation with the results of the first level prioritization by the usual ad hoc team approach. This model will undergo further validation effort in near future POM cycles and should provide a useful decision aid in subsequent program prioritization efforts.

2.3.2 COMPETITION

Of particular importance to the Air Force is the use of competition in selecting both the research and development and production sources in planning avionics acquisition strategy. Multiple development sources can provide a hedge on techncial risk and a base for subsequent production competition. Multiple production sources can provide a base for follow-on production competition and maintain the industrial base. These policies complement the policy of increased standardization, in that larger quantity purchases create greater industrial interest in the acquisition. The degree of competition can range from selected source to competing for the research and development portion only, to initial competition for production, to competition for each contract awarded, including follow-on contracts. Various techniques available include:

Leader-Follower. This concept is an extraodinary contracting technique under which the developer or sole producer of an item or system (the leader company) furnishes manufacturing assistance and know-how or otherwise enables a follower company to become a source of supply for the item or system (DAR 4-703, 1 July 76).

Purchase of Reprocurement Data. Technical data is procured from the development/production contractor to enable the government to obtain the same item from another source. This data can be obtained with the initial contract for the weapon systems/spares or at a later date. Purchasing of this data must be cost-effective to the government and determined on a case by case basis.

Licensing. This technique is the legal authorization for a second vendor to produce a given product. It is primarily used by vendors outside the United States.

Contractor Team Arrangement. This concept is one whereby two or more companies form a partnership or joint venture to act as a potential prime contractor or whereby a potential prime contractor agrees with one or more other companies to act as his subcontractor(s) under a specified government contract or program. (DAR 4-118.2, 1 July 1976).

Form-Fit-Function (F^3) Specification. A F^3 specification is a specification describing the relevant interfaces-mechnical, electrical, and environmental as well as the functions the equipment is to perform, but leaving the internal design and mechanization to the individual vendors.

Dual Development. This technique would allow two contractual sources to concurrently develop the same item.

Qualified Products List (QPL). This listing identifies the specification, manufacturer or distributor, item by part or model number or trade name, place of manufacture, and the test report involved. Contractors whose products have successfully passed qualification and who furnish evidence thereof are eligible for award. Use of this listing promotes competition by providing a standard for product development/production.

Selection of the particular technique to be employed for competition will depend on the particulars of the program including item complexity, contractor capability, cost, schedule, quantity and production rates, logistics factors, employment concept, and industry market conditions. The extent of competition and the technique used to achieve it must, however, be decided early in development to assure industry awareness and appropriate terms and conditions in the initial contracts. Where continuing production competition is contemplated, the Air Force's intentions must be made known to the contractors in the RFP. Implementation of a dual source approach during the development or qualification phase permits uninterrupted transition into quantity production. In addition to the use of competion to control acquisition costs, the acquisition strategy must also consider measures to reduce life cycle costs. Among the options which should be considered are use of contract incentives such as Reliability Improvement Warranties (RIW) or Logistics Support Cost Guarantees (LSCG); however, the disadvantages of RIW and LSCG including early program investments must be understood.

2.3.3 CURRENT ACQUISITION PHILOSOPHIES/CONSTRAINTS

Specific concepts/approaches are defined and directed in the Defense Acquisition Regulations. These philosophies and constraints are very dynamic and must be evaluated and applied based on the specific timing and requirements of each program. The current emphasis is to achieve enhanced readiness, reduced acquisition costs and shortened acquisition time through controlled decentralization. This emphasis is being carried out through implementation of thirty-one policy decisions which were announced by Deputy Secretary of Defence Frank Carlucci on 30 April 1981. These decisions are listed in Annex H for use by the avionics community in acquisition and modification programs.

Electronic Warfare acquisition has received recent emphasis with the intention of addressing EW acquisition problems and actions aimed at solving the problems. Specific areas addressed include intelligence, procedural delays in EW acquisition, test and evaluation, logisitics and rapid acquisition procedures. These problem areas and actions are discussed in detail in a 19 June 1981 Memorandum issued by Under Secretary of Defence for Research and Engineering, Dr. Richard Delauer. Excerpts from this memo are presented in Annex I for use by the community in EW acquisition.

Successful implementation of these acquisition guidelines is closely related to and dependent upon funding profiles applicable to the avionics program(s). Generally, enhanced readiness, reduced LCC, shortened acquisition time, and other contributors to "cost effectiveness" require modest additional investment early in the program cycle. Because of the overall constrained avionics budget, it is essential that the payoff from these investments be determined early and be presented effectively in order to influence the prioritization and budget process. Investment strategy is discussed separately in Chapter 5.

2.4 STANDARDIZATION

Avionics standardization has received considerable policy emphasis in recent years, as a contributor to reducing support costs. The goal is to continue this thrust to achieve rational avionics standardization in an environment of rapidly changing technology. This discussion will address levels of standardization, criteria for standardization, current standardization activities and considerations for standardization in future avionics.

2.4.1 LEVELS OF STANDARDIZATION

A discussion of standardization levels is essential to achieve understanding from the many different viewpoints on standardization (e.g., conceptual planner/developer, system program office, logistician or equipment supplier). It is also essential to achieve consistency on the definitions of key terms in an era of rapidly advancing technology. In the world of digital avionics, yesterday's subsystem is today's component and today's subsystem may be tomorrow's chip. Within this framework, interface standards at the proper architectural level facilitate future "technology insertion" into existing systems. In most treatments of avionics standardization, three distinct levels are discussed, piece part, module and subsystem.

PIECE PART STANDARDIZATION

As a general rule, piece part standardization has not been a major issue in the past few years. The Defense Electronic Supply Center (DESC) has a very active program serving all the services and industry by maintaining standard Department of Defense acceptable parts lists and aggressively minimizing that list; therefore, the individual services have not found it necessary to pursue a vigorous piece part standardization program.

MODULE STANDARDIZATION

The module is the next level in avionics architecture. The Standard Electronic Module (SEM) approach has been pioneered by the Naval Avionics Center at Indianapolis. This approach specifies the form, fit and function at the module or card level. Thus, with an existing library of Standard Electronic Modules that are common across many different kinds of functional electronic subsystems, a building block approach to the development of new subsystems can be taken. This approach has been used successfully by the Navy for the past 15 years in ship and submarine applications, but it never had widespread use in aircraft. Air Force reluctance to adopt this philosophy stems primarily from the cost, size, and weight penalties associated with the approach. There is however, renewed interest in this concept as the technology of VHSIC matures and new packaging concepts will be required to implement the full potential of VHSIC.

SUBSYSTEM STANDARDIZATION

The form, fit, and function (F^3) approach usually associated with commerical airlines and the "ARINC Characteristics" has received renewed interest within the Air Force in recent years. This next step up the level of standardization focuses on the subsystem. Although the F^3 approach has achieved a high degree of success in the commercial sector and is the basis for a number of important Air Force initiatives at this time, it should not be considered a panacea. In the civil sector there are numerous airlines, which fundamentally have the same mission, that is, to carry people or freight. The military on the other hand has significantly different missions, ranging from strategic bombers and airlift to high performance tactical fighter and intra theater airlift aircraft. This operational environment of extremes is what drives the state-of-the-art technology. Normally, MAC airlift most closely approximates the civilian mission. The civil sector for the most part has been satisfied to use mature

technologies/designs. The military, in many cases, is required to advance the state-of-the-art to maintain a capability edge in our fighting forces. Weapon delivery avionics or target acquisition avionics are typical examples. These three levels of standardization (piece part, module and subsystem) will continue to provide a hierarchical framework for standardization planning.

2.4.2 CRITERIA FOR STANDARDIZATION

Four factors have evolved as general selection criteria for assessing the standardization potential of a particular subsystem. They are the degree of technological maturity, architectural suitability, degree of applicability for multiple aircraft use, and total quantity of subsysems required during a specified period of time. Table 2-6 gives a word picture of these four criteria as least attractive; moderately attractive; and most attractive from a standardization point of view. One can quickly see from this chart why an ARC-164 UHF radio or an ARN-118 TACAN are standardization successes. One can also see why highly integrated systems with complex interfaces and a high degree of software implementation are the most challenging. This does not mean that all digital, highly interactive integrated subsystems cannot be standardized. It does mean that these simplified criteria must be expanded or adapted to exploit technology opportunities. Probably the single most significant development to facilitate standardization in highly integrated digital subsystems is the concept of the multiplex bus. It is absolutely essential that the military and industry cooperate to maintain firm, broadly applicable standards on multiplex systems. Software intensive subsystems require a focus on language control and rigorous management throughout the life cycle to achieve rational standardization.

The issues of technological maturity and architectural suitability require technical judgement to a great extent. The issues concerning aircraft applicability and planned quantities of subsystems are much broader in scope and must be analyzed from the standpoint of (1) Planned force structure and individual weapon system modification plans (2) Life Cycle Cost analysis (3) Market analysis including multiple service application (4) Priority of this program relative to competing programs (5) Funds availability for multiple aircraft modifications and large quantities of subsystems and (6) The degree of opportunity to conduct a program responsive to the cost and schedule constraints of multiple users. The better our tools to assess and quantify these criteria, the closer we can come to rational standardization.

2.4.3 CURRENT STANDARDIZATION ACTIVITY

Current standardization activities include forums and resulting initiatives which address application of current standards and evaluation of standards for emerging systems/subsystems. Key standardization forums include the standardization panel of the Armament and Avionics Planning Conference; the Joint Service Review Committee (JSRC); Joint Logistics Commanders (JLC) committees; JOVIAL User Groups (JUG); the American Society of Automative Engineers A-2K Committee; the Defense Material and Standards Board; the Air Standardization Coordinating Committe (ASCC) (US/UK/Canada/New Zealand) including various working parties -Navigation, Communications and Architecture; and NATO Standardization Groups which overlap with ASCC but now include France, Netherlands, Belgium etc.

TABLE 2-6 - CRITERIA FOR DETERMINING STANDARDIZATION POTENTIAL

CRITERIA	CATEGORY		
	Least Attractive	Moderately Attractive	Most Attractive
Technological	Performance requirements change frequently; state-of-art pacing equipments.	Functionally similar equipments exist in the inventory. Improvements (primarily packaging, reliability, etc.) are expected.	Previous Standarization precedent exists. Equipment currently exhibits high MTBF.
Architectural	High degree of interconnectivity with other avionics subsystems; moderate or higher degree of software implementation within subsystem.	Low degree of interconnectivity with other avionics systems; moderate or higher degree of software implementation within subsystem.	Low degree of interconnectivity with other avionics subsystem; very low internal software implementation.
Applicability	Used only in aircraft with similar performance characteristics or that operate in identical threat environments.	Used across multiple-aircraft types and in other military services.	Multiple mission and commerical usage.
Economic	Fewer than 2,000 USAF installed requirements indicated before 1992.	Between 2,000 and 4,000 USAF installation requirements indicated before 1992.	Greater than 4,000 USAF installation requirements indicated before 1992.

Standardization Panel initiatives are considered for multiple service application by the JSRC. The current standard central air data computer program evolved from this process. Current initiatives under consideration within the standardization panel and JSRC include Standard Intercom, Attitude Heading and Reference System (AHRS), Flight Data Recorder (FDR), Data Loader/Verifier, and time standards. The JSRC is also initiating a ground proximity warning system (GPWS) program for multiple service application. The JLC and JUG committees currently focus standardization efforts on higher order language and software support tools. The A-2K committee of the American Society of Automotive Engineers previously contributed to the MIL-STD-1553 multiplex bus standard. They are currently taking the lead on a high speed multiplex bus standard. The Defense Material and Standards Board covers the total spectrum of commodities including commercial items. They also provide guidance on the procedural aspects of standardization such as how to write standards. Currently, the JSRC falls under the scope of the Defense Material and Standards Board. The ASCC and NATO standardization groups tend to be oriented toward equipment standards versus architectural or procedural aspects of standardization. The ASCC consists of English speaking countries while the NATO standardization groups include participation with France and other Non English speaking NATO countries. Standardization initiatives frequently get started in ASCC committees and then are provided to the NATO standardization groups for further development. These processes produce Standardization Agreements (STANAGS) for application to planned multi-national programs such as the Combat Identification System (CIS) for next generation cooperative IFF.

2.4.4 FUTURE AVIONICS STANDARDIZATION

The shape of the future for avionics standardization opportunities will be determined by four major factors. They are: (1) current avionics (2) the budget allocated to avionics (3) the threat and (4) technology. Current avionics standards are best summarized by the "triad" of architectural standards (MIL-STDs 1553, 1589 and 1750) and the preferred items list of avionics equipment/subsystems per AFSC/AFLCR 800-31. MIL-STD-1760 (Aircraft/Stores Electrical Interconnection System) is a recent fourth addition to the triad.

New/improved standards are already emerging from this current set of standards. A joint AFSC/AFLC activity is underway to improve the preferred items list. The preferred items list is, by definition, intended for near term application. The equipment on this list is characterized by mature technology and demonstrated characteristics suitable for standard application. Maintaining this list and timely/effective use of these standard equipments will require continuing effort. Ada has been selected as the next standard higher order language (HOL) beyond J-73. There is effort underway to establish a higher speed multiplex bus standard beyond MIL-STD-1553. Considerable effort has gone into establishing Packaging-Mounting-Environmental (PME) standards which would be patterned after the ARINC characteristics used by the airlines. PME standards may emerge as a real factor if we are to achieve full benefit from VHSIC technology. PME standards, coupled with benefits provided by VHSIC technology could lead away from the box concept towards a lower level of interface standardization.

Existing system and subsystem architectures and evolving changes as discussed above will continue to constrain more rapid movement to highly integrated operational systems. Budget could be another major constraint. Significant additional funding above current levels will be required to address the threat and exploit emerging digital technology without the penalty of added crew workload. A continual constrained budget may lead to more than a decade of avionics enhancements which occur primarily through retrofit or derivative aircraft. This could mean more meshing of new technology into old avionics architectures and all the attendant problems which include excessive modification cost. The challenge for standardization is to develop methods and compatible architective techniques that minimize these cost penalties.

The threat coupled with technology opportunity will continue to call for "revolutionary" changes in system/subsystem concepts in spite of the above pressures for "evolutionary" change. The need for improved cockpit automation as well as improved subsystem performance will push toward more highly integrated avionics systems and subsystems and require new standardization tools suitable for the new systems. The AFWAL Major Technology Thrusts as well as other technology base efforts are aimed at these next generation avionics capabilities. Sufficient 6.2 and 6.3 funding will be required to meet this need.

The overall management challenge for rational standardization is an on-going flexible policy that accomodates the changing threat and technology. Policies must also permit rational application of revolutionary concepts when the technology is available. The key for success in this approach is on-going planning and managing of technology transition between the laboratory communities and the product divisions. Much closer coupling between these two communities is required if timely FSD/Production is to be achieved. The New Threat Warning System (NTWS) employes this concept. The FSD/production implementation approaches to be taken will cover the full spectrum including class IV/V modification, P^3I, technology insertion in new start programs, and revolutionary system approaches in next generation aircraft. Timely, effective application of new technologies such as VHSIC will require that all of these approaches be used. Another ingredient for success is master modification planning, especially for those aircraft which will receive the majority of avionics modifications. Harmony between modification planning, opportunity windows for technology insertion, and program management planning is necessary if we are to achieve efficient subsystem production rates and minumum aircraft down time. Standardization concepts must keep pace with this dynamic environment to provide affordable avionics enhancements and avionics support.

CHAPTER THREE

AVIONICS TECHNOLOGY

This chapter will present a discussion of the seven major avionics technolgoy areas which include Microelectronics; Radar; Electro-Optics; Electronic Warfare; Communications - Navigation - Identification; System Integration, Analyses and Software; and Avionics Logistics Support.

3.1 MICROELECTRONICS

Background

The future developments and trends in avionics devices and systems will continue to depend on advances made in microelectronics. Microelectronics, as used here, describe the basic materials, techniques, and processes required to develop high density functional electronic devices, the fabrication of these devices into functional modules, and the packaging of these modules into functional subsystems (processors, memories, computers, etc.). Most of the technological achievements of the past decade have depended upon microelectronics. Small, reliable sensing and control devices are the essential elements of modern weapons and the complex systems responsible for landing men on the moon and exploring Mars. Microelectronic devices are also the essence of new products ranging from communications satellites to hand-held calculators and digital watches. Microelectronics has greatly enhanced the capacity of the computer for storing, processing, and displaying information. The small size of these devices has been important in many applications but the major impact has been to make electronic functions more reproducible, reliable, and much less expensive. Electronic device functional density has increased at a rate of 2x per year since 1959 (introduction of planar technology). This trend is expected to continue as we develop Very High Speed Integrated Circuits (VHSIC), see Figure 3-1. Capacity, performance, and reliability continue to improve each year; price per function continues to decline. Storing a bit of memory now costs 25 millicents. The prediction is that it will cost 1 millicent in the mid-eighties. One logic function now costing 50 millicents is predicted to decrease to 3 millicents in the mid-eighties. This trend is depicted in Figure 3-2.

Current Emphasis and Trends

The industry through their Very Large Scale Integration (VLSI) orientation and the government via the VHSIC program continues to emphasize the use of silicon. The design/availability and system insertion of VLSI/VHSIC may be one of the great technological achievements of the 1980s.

The Integrated Circuit (IC) world, which is practically synonymous with microelectronics, is dominated by silicon devices and silicon technology. The current state-of-the-art is best demonstrated by the availability of the 64K bit dynamic Random Access Memory (RAM) and a 16-bit microcomputer. The RAM consists of over 65,000 active elements on a silicon chip, bringing ICs to the threshold of Very Large Scale Integrated Circuits (VLSIC) (i.e., 100,000 active elements per chip).

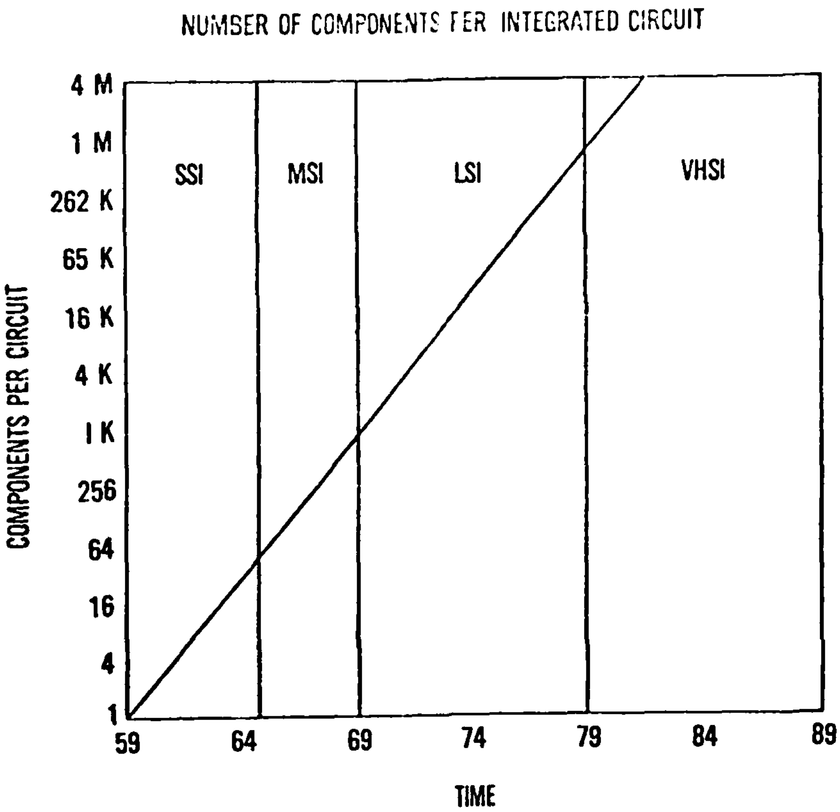

Figure 3-1

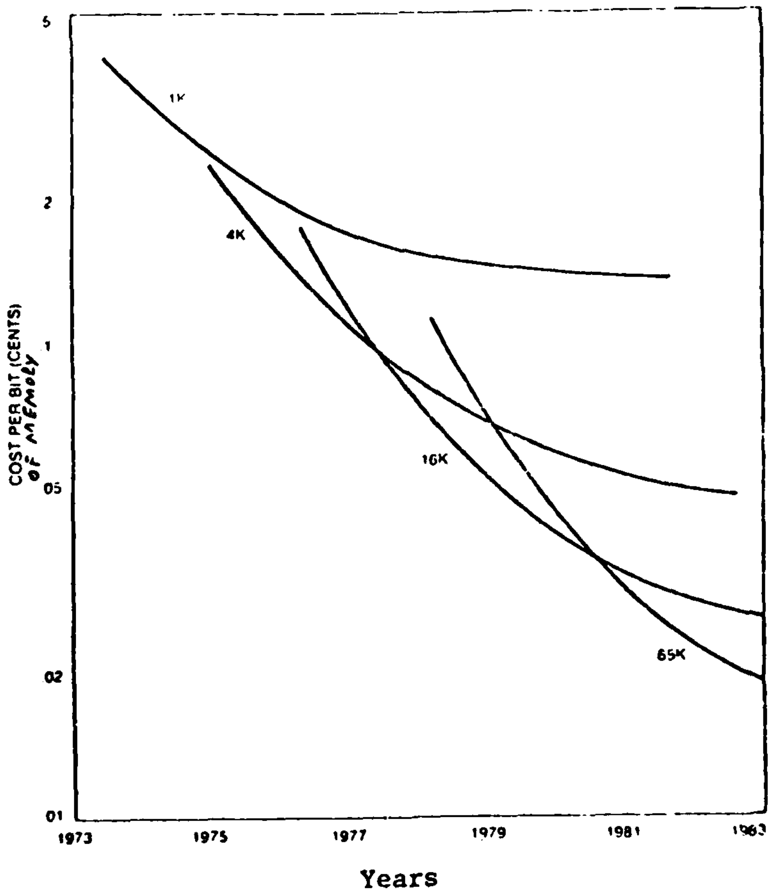

Figure 3-2

The design of such structures as VLSI/VHSIC RAMs, and the repartitioning of computer subsystems into VLSI/VHSIC densities are difficult tasks but should lead to "Computational/Processing Plenty" in the 80s. Consider two examples:

(a) Putting together up to a thousand processors and their interconnections on the same wafer to create a parallel processing device. One application would be to compute the real time images produced by side looking radar at the rate of 3×10^{13} multiplications a second.

(b) Linking several dozen sophisticated processors on a chip so that the ensemble could approach or exceed the power of present large mainframes. As a bonus, new processors could be added to expand the processing power.

Microelectronics technologists are predicting that, sometime in the 80s, we will be approaching the limits of silicon IC speed performance. Possibly, the next major leap forward (beyond 1990) will occur due to advances in Gallium Arsenide (GaAs). GaAs is now being used primarily to produce discrete components as laser diodes and microwave sources and amplifiers. GaAs has four to ten times the speed of silicon due to higher electron mobility. It is a direct bandgap semiconductor and can operate at higher temperatures (350°C) before experiencing large leakage currents. See Figure 3-3.

	Silicon	GaAs
Speed		
o Logic ICs	1 GHz	2-10 GHz
o CCD	250 MHz	1 GHz
o Transistors	5 GHz	40 GHz
Optical Devices		
FET-Laser Integration	No (Indirect)	Yes (Direct)
High Temp. Oper.	200°C	350°C

FIGURE 3-3

The present level of integration of GaAs is at best a Medium Scale Integration (MSI). Some potential military applications for GaAs ICs would be (a) satellite communication components, (b) direct radar signal processing, and (c) radar receiver/transmitter integrated circuits. Improvements in satellite communications components will occur so that very high speed data reduction and data analysis can be accomplished via on-board data processing circuits. As a result of these improvements, down-link data rate will be reduced. Direct Radio Frequency (RF) signal processing of radar signals cannot be achieved with current technology. Radar typically operates in the L-band region and above. In this region it is not possible to operate silicon integrated circuits. With GaAs, radar pulses can be processed in real time using ICs operating at radar frequencies. Radar receiver and transmitter ICs for front end applications (e.g. phased array radar) are probably going to be very pervasive in the next ten years.

Phased array radars represent a fairly large application potential for GaAs components and subsystems. Each antenna element requires its individual set of microwave electronics, and a typical phased array radar may have tens of hundreds of antenna elements in the array.

In another area, microelectronics will make it possible over the next several years to design fault tolerant, probabilistic problem solving and/or situation sensing and responding avionics systems. Total concepts with automatic fault detection and correction are a distinct possibility.

3.2 RADAR TECHNOLOGY

Background

The state-of-the art in radar technology (techniques, components, subsystems) can be represented by capabilities demonstrated in advanced engineering development. Recent advanced development programs have demonstrated the use of digital signal processing and radar control to provide multi-mode radar capabilities applicable to strategic and tactical mission functions. Multi-mode radar functions such as high resolution Synthetic Aperture Radar (SAR) mapping, precision navigation update, terrain following and terrain avoidance have been demonstrated in advanced development programs. These programs also demonstrated the performance advantages and flexibility afforded by the use of electronically scanned and stabilized phased arrays. High resolution synthetic array mapping is presently in operational use for reconnaissance functions. Through the use of programmable digital signal processors, a moderate to high resolution SAR capability is being tested for possible addition to airborne fire control radars such as the APG-63 in the F-15 aircraft.

The current generation of operational airborne fire control radar is typified by the AWG-9, APG-65, APG-63 and APG-66 radars for the Navy F-14 and F-18, and Air Force F-15 and F-16 fighters, respectively. These pulse-doppler radars provide search and automatic track/acquisition of designated targets and target illumination for semiactive missile seekers.

A comparison of the F-16 and F-4 illustrates the progress in tactical radars for fighter aircraft. The Air-to-Air pulse doppler capability of the F-16 radar includes a look-down capability against ground clutter which the F-4 does not possess. In the air-to-ground mode in the F-4, the normal real beam mapping, ground ranging and beacon modes are performed. In the F-16 pulse doppler radar, doppler beam sharpening for increased augular resolution, sea

search using frequency agility, and digital Moving Target Indication (MTI) are performed. The F-16 radar has a freeze mode of ground mapping for quasi-quiet strike mission navigation. A growth provision for target illumination for missile guidance is included in the design.

The F-16 radar (APG-66) is one third the volume, one half the weight and has a substantially improved Mean Time Between Failure (MTBF) over the F-4. Extensive use of digital signal processing and control via digital data bus allowed a parts reduction of greater than 50%. Air cooled Traveling Wave Tube (TWT) versus liquid cooled magnetrons and a planar array antenna also contribute to the radars simplicity and reliability.

Current Emphasis and Trends

Tactical battlefield surveillance and weapon delivery by airborne radar is a current subject of major interest to several agencies and is being addressed by several programs including Target Acquisition Weapons Delivery System (TAWDS). TAWDS is an advanced development program which will combine long range surveillance with radar guided weapon delivery. It uses low probability of intercept waveforms and radiated power programming to increase survivability. Implementing Electronic Countermeasures (ECM) resistance will require all the projected capability of VLSI and VHSIC.

Several areas of technology investigations are being studied that will have a major impact on future radar capabilities. Effort continues on development of ultra high resolution SAR technologies/techniques and automatic ground target classification technologies targeted for precision all weather weapon delivery. A new program will develop the capability to detect and locate ground moving targets not observable using conventional MTI techniques. These targets, including those at large squint angles, will be displayed in context on a SAR background map. A second new effort will develop low probability of intercept radar techniques for terrain following. A concentrated effort is underway to develop a bistatic radar concept for "covert target acquisition and weapon delivery". Although active radar illumination is utilized, the transmitter is remotely located at a long range stand-off position while the weapon delivery aircraft operates in a passive acquisition mode. The illuminator can be airborne or spaceborne, for instance, with the receiver located in a covert penetrating aircraft. This bistatic concept has been demonstrated on an exploratory development program called Tactical Bistatic Radar Demonstration (TBIRD). The bistatic radar concept is being further developed in a joint DARPA/Avionics Lab exploratory development program called Bistatic Technology Transition (BTT). Also, COVERT STRIKE is an advanced development program currently scheduled to start in FY84.

Radar signal processing is now being accomplished digitally; however, the signal processor designs have been tailored to specific systems. The increase in digital implementation speed and density, now contemplated, dictates that future radar processors be programmable and more flexible. This concept is being pushed for airborne radar designs which must be multimode, e.g., Air-to-Surface target acquisition/attack, navigation, and fire control. A major push is also underway to achieve near real time on board signal processing for high resolution SAR surveillance applications.

Several of today's radars use digital processing of pulse-to-pulse coherent returns to suppress clutter, cancel chaff, adapt thresholds on range and doppler bins and do self test while operating. Future systems will do these functions and more with VHSIC processors that occupy a few drawers of electronics instead of several racks.

The trend toward multifunction radar transmitters results from the need for flexibility, reliability and reduced cost. Traveling wave tubes and crossed field amplifiers will operate efficiently in a variety of modes to allow a selection of optimum signal characteristics for different radar system functions. Solid state GaAs Field Effect Transistors (FETs) and Impact Avalanche and Transit Time (IMPATT) diode microwave devices offer even higher reliability, smaller size and weight, and have the potential for even lower cost. The solid state (active element) phased array has been proven a practical approach for radar due to significant advances in direct I-band power generation using GaAs FETs. Device phase and amplitude linearities provide suitable error boundaries for high performance systems where low side lobe and pulse compression techniques are used.

3.3 ELECTRO-OPTICAL TECHNOLOGY

Background

This area of technology encompasses the concepts, devices, measurements and sensor technologies operating between millimeter (MM) and ultraviolet (UV) wavelengths which are being developed for target search, acquisition, classification and weapon delivery. The major systems attributes being sought are low system cost, day/night limited weather operation, and performance improvements for strategic and tactical missions. The current emphasis is on tactical applications in single seat aircraft. A high degree of functional automation (i.e., acquisition, identification, weapon delivery) will be required and is being emphasized for these applications.

Current Emphasis and Trends

Electro-optical sensors, because of their inherent high resolution, offer the best alternative for recognizing moving and stationary targets. Electro-optical (E-O) sensors are being developed for Forward Looking Infrared (FLIR), laser radar, and E-O/millimeter wave hybrid systems. Supporting technologies in optical sources, detectors (focal plane arrays) and processing techniques are being developed. The objectives of current E-O technology programs are to satisfy the high speed, low altitude, high threat environment of tactical aircraft such as the F-16. The target acquisition, recognition, and weapon delivery requirements for such aircraft are being addressed by the Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) program. LANTIRN is to be a Pod mounted low altitude day/night, adverse weather weapon delivery system. The extension of the E-O technology to space systems is being addressed and receiving increasing emphasis.

Two approaches to FLIR sensors distinguished by wave-lengths for tactical applications are being evaluated: 3-5 microns (Army), and 8-14 microns (Air Force). Both approaches will utilize either Silicon (Si) or Mercury Cadmium Telluride (HgCdTe) focal plane arrays, incorporate miniaturized optics, precision stabilization and automatic target detection, cueing and classification techniques which are being developed concurrently. Data processing and automatic target screening techniques are also being evaluated.

A Carbon Dioxide (CO_2) laser radar is being developed. Studies indicate that a CO_2 multifunction laser radar could operate more effectively than longer wavelength sensors in areas of low visibility at low altitudes, over short ranges. A program is being conducted to demonstrate the capability of a low power (approximately 10w) CO2 laser radar. The functions to be incorporated in the radar include Terrain Following (TF), Terrain Avoidance (TA), Obstacle Avoidance (OA), search, detection, real time classification, doppler navigation, low altitude flight control against mobile targets, and weapon delivery. A near term objective is to demonstrate the effectiveness of a CO^2 laser radar to provide TF/TA/OA in a Combat Search and Rescue Helicopter.

The third E-O sensor being actively pursued is a hybrid that integrates E-O and millimeter wave techniques. Currently, E-O sensors have the capacity to provide high resolution images, target classification and high aim point accuracy for weapon delivery but lack the acquisition, weather and smoke penetration capabilities of longer wavelength sensors. A millimeter wave augmented E-O sensor could provide stand-off target acquisition with resolution adequate to perform hand-off to a high resolution E-O imaging sensor for accurate tracking target recognition and weapon delivery. This integrated system could provide wide area, long range search and acquisition with high precision target classification, tracking and weapon delivery. This technology is in the early stages of development.

These three sensors are being developed to operate in high threat environments. Therefore, electro-optic counter-counter-measure techniques are being developed for each sensor concept. Additionally, E-0 tower experiments over "real paths" are being used to evaluate the sensor systems performance and establish baseline performance envelopes for technology improvements. However, the most significant improvements in sensor system performance will be the result of improvements in components and signal processing technologies. Therefore, an aggressive, complementary program is being pursued in these areas.

Programs for E-O components are concentrating on developing detectors and laser sources. Single elements and detector arrays operating in the 3-14 micrometer range are being developed for the E-O sensors described above. Current goals include improved gain, reduced dark currents, increased bandwidths, and higher operating temperatures (175-200°). Fabrication of photovoltaic and photoconductive detectors as well as avalanche photodiodes and Charged Coupled Device (CCD) detectors are being pursued. Efforts include improving the performance of detectors for coherent detection for laser radar applications and improving incoherent detection for reconnaissance, surveillance, target acquisition, tracking, threat warning, and satellite borne star sensors. Laser source programs are directed at the development of medium power (10w) lasers with wavelength agility. Goals are lightweight, small devices with high operating efficiency at wavelengths from 0.5 to 5 micrometers. The performance of existing lasers is being improved and their wavelength output is being extended. Other programs seek technological improvement for continuous wave, modulated and pulsed output power sources.

Future trends of E-O sensors and techniques are to provide a nonscanning thermal imaging set that uses a large, uniform, two-dimensional focal plane array. Future FLIRs will be significantly smaller and lighter than current FLIRs and are expected to be more reliable due to reduced mechanical complexity and the use of VLSI technology. Another trend in E-O technology is the increasing interest in active E-O sensors of CO_2 laser and millimeter wave (MMW). It is anticipated that MMW sensors will be used in conjunction with and as cueing sensors.

3.4 ELECTRONIC WARFARE SYSTEM TECHNOLOGY

Background

The ultimate goal in the Electronic Warfare (EW) community is the development of systems which are tailored to the force composition and employment and which will have acceptable performance against the entire threat spectrum for the design life of the equipment. This goal, which is tantamount to the achievement of technological supremacy, is not attainable, with peace-time budget restrictions. However, the systematic development of fully integrated, full spectrum offensive/defensive systems offer the greatest opportunity for success.

U.S. technology has advanced so rapidly that equipment designs for countermeasure systems are possible today that were considered impossible a few year's ago. Microprocessors and Large Scale Integration (LSI) permit the automation of the most complex EW system designs.

Threat systems are becoming more diverse and greater agility is required to identify and prioritize threats. Exploratory and advanced development work on Surface Acoustic Wave (SAW) channelized, microscan, and optical processing types of receivers offers the processing speed to cope with high density threat environments within the volume constraints of modern aircraft.

RF jamming systems are well established in terms of designs for both inboard use and pod type applications. Existing jammers have been proven effective in countering both target track and surveillance type radars. However, developing the capability to counter monopulse type radars is high priority. The power output of jammer transmitters are limited to several hundred watts. Modern applications require at least a tenfold increase in power output level. High gain antenna techniques exist that can be employed to increase Effective Radiated Power (ERP) thereby compensating for limited transmitter power.

An advanced development program is being pursued by the Avionics Laboratory which offers a potential solution to jamming sensors in the visual portion of the electromagnetic spectrum.

Infrared (IR) flare developments are continuing in an effort to improve pyrophoric flare spectral characteristics to more nearly match the IR signatures of selected aircraft with sufficient energy output to decoy IR terminal threats. Pyrophoric material compositions are being developed to best control rise time, burn time, total energy emissions and spectral matching.

Signature reduction techniques involving vehicle shaping, metallic radomes, low Radar Cross Section (RCS) antennas and radar absorber material are being developed to improve survivability. High temperature non-specular, magnetic Radar Absorber Material (RAM) is being developed which will substantially reduce non-specular radar echo. Circuit Analog RAM for treatment of aerodynamic leading edges is also being developed.

This RAM exhibits an aerodynamic exterior shape and should be an effective absorber over a wide frequency spectrum.

Current Emphasis and Trends

Warning system capability will be extended through integration of multi-spectral sensors and by increasing detector sensitivities and lifetimes. The correlation process can be made adaptive to the threat and its characteristics. The trend toward integration will provide the means for consolidating and correlating warning information from multiple sensors for rapid viewing on a single display system.

The processing of radio frequency signals becomes ever more demanding as the threat environment grows in complexity. The increase in the number of RF systems, increasing diversity in use of the RF spectrum, multiple emitters serving a single weapon system, and increasing use of parameter agility combined to intensify the workload of both receivers and processors. Signal processing speed will increase for the Advanced Power Management System (APMS) and should further increase for the multiple array processor system. Concurrently, receiver size will be decreased substantially.

The trend in RF jamming is toward concurrent coverage of greater numbers of signals. Threat environment factors such as increasing numbers of weapons that threaten survival, greater diversity in the RF spectrum and increasing jam to signal ratio dictate that jammers be able to concentrate their power. This requires that the jamming response be selective in terms of frequency, time, space, and character. Time sharing and power sharing techniques will be further developed and used much more extensively to maintain jamming capability. Power management is being explored to provide the means for coping with the threat.

Electro-optical countermeasure systems employing lasers must be reduced greatly in size and weight so that they can be employed with tactical aircraft. Meeting the design constraints of tactical systems will satisfy the needs of strategic systems as well. In the case of infrared countermeasures, the intermediate goal is to reduce system size to a few hundred pounds and a few cubic feet. Efficiency is also a critical problem, because primary power input must be reduced while pushing output power toward the kilowatt level. Improvements in areas such as chemical pumps may enable a size reduction of a factor of ten. Multiple wave-length output has become a definite need and will be an important factor in laser development.

Reduction of Radar Cross Section (RCS) is an important part of survivability because it affords reduced probability of detection and a corresponding reduction in the jammer power needed for self-protection. RCS reduction can be achieved by replacing the conventional dielectric radome with a metallic radome. Metal radome designs have been developed to the point that, in their operating band, they can perform as well or better than conventional designs. They have demonstrated low transmission losses and reduced boresight errors for large angles of incidence. Also of interest is the inherent ability to provide lighting strike protection, reduce the effects of Electromagnetic Interference (EMI) and precipitation static, provide laser hardening and provide some protection against nuclear flash. Vehicle shaping is also very important in achieving reduced signature. Much has been learned about the effects of shaping in the RF domain, but current knowledge is inadequate when E-0 systems are considered. Current work includes investigating E-0 behavior and in sorting out the significant features that determine aircraft E-0 signature.

3.5 COMMUNICATION, NAVIGATION AND IDENTIFICATION AVIONICS

Background

The three functions in this area have traditionally been treated separately. Each function has been implemented in one or more independent black box systems (i.e. a separate system for: voice, data, radio-navigation, inertial navigation, attitude and heading reference systems, cooperative Identification Friend or Foe (IFF) transponders and interrogators). Current tactical requirements call for increased accuracy and for protection against jamming of the electomagnetic signal links. This creates a need for a new generation of Communication, Navigation, and Identification (CNI) implementing hardware, much of which is in addition to the current CNI suite. Even with significant advances in technology, the additional black boxes required may need more space than is available in tactical aircraft. The cost of the new boxes is high, and the cost will be compounded by the problems of integrating functions together and into the aircraft.

Current Emphasis and Trends

The trend in avionics is towards fusion--fusion of information for example in the Digital Avionics Information System (DAIS) and Advanced System Integration Demonstrations (PAVE PILLAR) programs. This trend is being extrapolated into the fusion or integration of sensors. In the CNI technical area, the emphasis is on integration functions which have previously been independent, and on the coordination of device, circuit, and subsystem technologies required for integration. The two major concepts supporting integration are the Integrated Communication, Navigation and Identification Avionics (ICNIA) program and the Integrated Inertial Reference Assembly (IIRA).

ICNIA: The long term goal of ICNIA is the development of a multifunction, multiband adaptive radio system. The groundwork for this was laid in exploratory development under the multifunction, Multiband, Airborne Radio System (MFBARS) studies which considered possible architectures based on an extrapolation of the technology which would be demonstrated by 1985. In preparation for the award of demonstration terminal build-and-test contracts in 1983, two designs are being iterated in "system definition" studies now under way. One is a conventional radio architecture, i.e., signal downconversion, filtering, detection and signal processing (with the exception, that an integrated digital signal processor is used for all signals once their bandwidth is reduced below 100 KHz). This design provides significant size and weight reductions by applying Radio Frequency Large Scale Integration (RFLSI) technology. The second design is unconventional in that signals are processed immediately as analog value-time discrete samples, through programmable Finite Impulse Response (FIR) transversal filters. The speed of GaAs technology and the transversal filter architecture are well adapted to the cost-saving principles of commonality at the module level and time sharing, possibly even the interleaving of samples at the instantaneous signal bandwidth sampling rate. One or both of these approaches, depending on progress in the technology and definition studies, may be implemented in a hardware demonstration of Integrated CNI Avionics, with test and evaluation coupled with cost analyses to show the savings.

ICNIA Technology: The MFBARS studies indicated that the preponderance of the RF and analog circuitry constitutes the major portion of the terminal cost. Our major emphasis has thus been on technology which affects this circuitry. RF LSI techniques are being applied to the development of a front end module (down to Intermediate Frequency (IF)) in which most of the RF circuitry is on two or three chips. Initially chip development will address RF signals below 500 MHz. Subsequent development will be extended to cover the 900 to 1300 MHz range. The transversal filter investigation includes two time delay mechanisms with on-chip tap weight programming: A GaAs CCD and a tapped SAW structure. These programs will result in a major hardware Advanced Development Program (ADP) in 1983.

IIRA: Current aerospace vehicle reference information requirements are accomplished through special purpose inertial sensors and components. This approach results in a large number of sensors and excessive life cycle costs. The Integrated Inertial Reference Assembly (IIRA) approach involves using a minimum number of redundant sensors, either collocated or distributed. Initial efforts were completed in FY 1978 under the Multi-function Inertial Reference Assembly (MIRA) program. Results from these analytical studies and demonstrations showed significant life cycle cost reductions and improved probability of mission success via an IIRA approach. The MIRA results also indicated further work was needed in the areas of improved strapdown inertial systems performance, fault detection and isolation algorithms. In FY 1980 two studies were begun to reduce the technical risk of IIRA. The Strapdown Performance Study is concentrating on improving strapdown inertial system performance. The multi-function Flight Control References System Study, addresses critical flight safety issues and uses clustered and collocated ring laser gyroscopes and accelerometers for flight control.

Inertial Reference Systems Technology: Two areas are being emphasized. First, component and system developments leading to a high-accuracy strapped down inertial navigation system for advanced fighter and cruise missile applications. Second, cost reduction efforts in molded plastic sensor technology and application of this technology to high-accuracy and Ring Laser Gyroscopes (RLG).

Component research for the high-accuracy system include RLG developments. An extensive program is under way to investigate cruise missile carrier aircraft gravity model inaccuracy. These component development efforts support a cruise missile Inertial Navigation System (INS) which requires fewer and less extensive fixes (e.g., Terrain Contour Matching (TERCOM)).

Low-cost molded inertial sensors development is a part of the High Accuracy Molded Inertial Technology program. A follow on effort will include improved material properties, molding precision, and assembly techniques. Three primary areas are to be investigated under this new effort: (1) the development of a demonstration robotic assembly station; (2) the development of a molded Inertial Measurement Unit; and (3) the development of a molded RLG.

Specific Communications Developments: Airborne terminals are being developed for satellite relay communications to achieve jam-resistant links for the E-4 and Crisis Management. These terminals could replace existing terminals in airborne command post aircraft incorporating Air Force Satellite Communication System (AFSATCOM), General Purpose Satellite Communication System, Survivable Satellite System and the Defense Satellite Communication System. Primary emphasis is on signal structure and modulation techniques to achieve the antijam margins. Currently, UHF and millimeter wave (36-45 GHz) system developments are nearing completion; the acquisition of a small, tactical Super High Frequency (SHF) (7-8 GHz) terminal is expected soon. EHF development efforts are being conducted under AFSATCOM and MILSTAR programs. Development of a conformal phased array antenna for use in SHF systems is planned. This development is critical to providing a SHF satellite communications capability for the EC-135 Crisis Management Platform. Another effort, the Command Post Modem/Processor (CPM/P) will develop technology to support a flexible, programmable modem. The CPM/P will also perform antenna pointing, message processing, and operator controls/displays interfacing. Work is also being done to develop solid state, high power amplifiers in support of these programs. In the area of jam-resistant imagery transmission, primary emphasis is placed upon design and development of spread spectrum modulation/demodulation techniques.

3.6 SYSTEM INTEGRATION, ANALYSES AND SOFTWARE TECHNOLOGY

BACKGROUND

Current weapon systems integration implementations are oriented by functional areas, typical functional areas being flight control, stores management, electronic warfare, navigation, weapon delivery, communications, electrical power control, engine control, dedicated controls/displays, thermal management, etc. The systems integration which exist is limited to the subsystem or intra-functional level. This subsystem approach arises partially because of the lack of technology to support a total systems integration approach and partially because of traditional political boundaries. With the recent adoption of MIL-STD-1553B, Aircraft Internal Time Division Command/Response Multiplex Data Bus, some of the newer weapon systems (F-16, F-18, B-1, B-52, A-10) have begun the task of integrating beyond the subsystem level. However, even these newer system integration activities have encompassed only the basic avionics functions of navigation, weapon delivery, communication, and to some extent, controls, displays and thermal management.

Current Emphasis and Trends

Current system integration technology could support greater avionic system integration than has been implemented. With the availability of MIL-STDs-1553B, 1589B (Jovial J-73 High Order Language), and 1750A, Sixteen-Bit Computer Instruction Set Architecture, interfaces can now be defined which support the total systems integration of on-board avionics. Current life cycle cost techniques can support analyses incorporating hardware and software development cost, reliability and maintainability. However, there are no generally acceptable analysis techniques which provide operational effectiveness trade offs for integration of avionics functions. Present capabilities to evaluate avionics multiplex networks depend on a combination of analytical methods, computer-aided simulations and hardware emulations of a specific architecture. These approaches extrapolate models which were developed for nonreal time networks such as the Arpanet, Infonet, or the telephone exchange system.

New approaches for avionics system analysis are being investigated. These approaches can be described as: (1) the development of data bases, models, and algorithms of distributed networks for computer simulations; (2) investigation of hardware design languages as vehicles for describing avionics networks: (3) development of Petri Net-models and use of automata theory and (4) development of theoretical models to define and analyze fault tolerant systems and development of predictive hardware/software life cycle cost models for a total avionics system.

Approaches for integrating aircraft electrical power system control and management functions into a digital avionics information management system are being investigated by the Aero Propulsion Laboratory with technical guidance provided by the Avionics Laboratory. The control requirements and data bus architectures are being developed for a 2-engine tactical aircraft. An advanced aircraft electrical power system control demonstrator may be developed to allow laboratory evaluation of integrated control architectures.

A major new advanced development program, Advanced System Integrated Demonstration (PAVE PILLAR) will provide the technology for highly integrated, fault tolerant, and supportable avionics suites. By resolving issues of architecture, information integration, controls, and displays, and related avionics performance drivers, PAVE PILLAR will allow next generation combat aircraft to exploit the power of automatic, standardization and real time processing.

In the analysis area, several exploratory development programs are currently being conducted that address system analysis methods for conceptual development of core avionics architectures and analysis of the mission effectiveness of these systems. A generalized hardware and software approach to fault tolerant networking based on a three-dimensional lattice of processor modules known as CHAMP, Cooperative High Availability Multiprocessor Architecture, is under development. The program addresses: (1) fail safe or graceful degradation potential, (2) expandable hardware and software, and (3) software reconfigurability.

A major effort is being conducted to define and evaluate a distributed-processing, fault-tolerant avionic network for an advanced tactical fighter aircraft. This will include: (1) determining fault tolerance requirements, (2) definition of system control procedures, and (3) structuring the network architecture by partitioning generic avionics tasks. The availability of analytical and simulation approaches to these analyses is severely limited.

The challenge of the future will be in developing support software which does not cost more than the cost savings made possible by hardware advances. One aspect of an Air Force standardization strategy would be the development of a MIL-STD-1750A instruction set-based family of computers with an attendant standard support software environment.

Emphasis in employing standardization concepts has led to the development of the Ada Higher Order Language. This new language will be ready for implementation by FY 1985. A standard support software environment should be developed for this language. Plans call for the development of several host compilers, code generators, and general software development tools for Ada.

Fiber optic technology will also significantly impact future integrated system implementations. It is believed that inherent Electromagnetic Interference (EMI), Electromagnetic Compatibility (EMC), and Electromagnetic

Pulse (EMP) immunity properties will initially provide impetus for its use in a MIL-STD-1553B format. Subsequently, wideband fiber optics (up to 50 Mbits per second) will probably be utilized in point-to-point applications and as a medium for subsystem/system integration.

In the foreseeable future, it is anticipated that low cost digital hardware, increased subsystem complexity, and a continued need for retrofit capability will result in accelerated development of highly integrated, digitally controlled (possibly bus-oriented) subsystems.

Several concepts are being explored which will directly or indirectly influence aircraft and spacecraft electronics system integration in the future. They can be categorized into three areas:

a. Development of Total System Engineering Techniques Technology

This concept provides a standardized building-block approach to system integration. This approach is best exemplified in the Digital Avionics Information System (DAIS). DAIS provides a system integration approach which offers ease of subsystem/system integration and retrofit, using approved Air Force digital system standards (e.g. MIL-STD-1553B, MIL-STD-1589B and MIL-STD-1750A). In addition to providing a carefully designed software executive to application code interface and a support software approach which permits ease of system buildup and change, a modular controls/displays approach is employed to accomodate dramatic crew information changes over the life of a system. The baseline established in DAIS will be continued and expanded in PAVE PILLAR.

b. Development of Consolidated, Integrated Functional Subsystems

This multifunction subsystem approach provides greater operational flexibility. Examples are synthetic aperture radars, and combined target acquisition sensors. Synthetic aperture radar technology developments have resulted in combining several functions normally requiring several different radars (e.g. terrain mapping/avoidance/following, and velocity/position update). Future work will exploit this technology into a counterair and air-to-ground tactical role, including look down-shoot down capability. Several efforts are underway to exploit the combined effects of various sensors in detecting, recognizing and identifying both air-to-air threats and ground targets. The survivability implications of multisensor integration is under investigation, along with the development of an optimized threat response strategy which reduces man-in-the-loop requirements for threat negation.

c. Development of Coordinated Inter-Subsystem Technology

Dramatically improved air-to-air and air-to-ground weapon delivery and enhanced survivability are expected to result from the integration of target acquisition, weapon delivery, and flight control subsystems manifested in this approach. Another similar coordinated approach is the Flight Dynamics Laboratory's Integrated Flight Trajectory Control program which is currently investigating operational benefits derived from the sharing of navigation and flight control information. One aspect of the concept is to use prestored threat locations (with in-flight updated threat information provided by Joint Tactical Information Distribution System (JTIDS) to automatically steer around threat locations in order to maximize survivability. Further, weapon delivery profiles can be optimally programmed to reduce aircraft threat exposure at the target site.

Substantial improvements in the automatic detection and optimum weapon conversion against small mobile ground targets is the aim of the Integrated Strike Avionics System Program.

3.7 AVIONICS LOGISTICS SUPPORT TECHNOLOGY

Introduction

The Air force faces a critical problem: Logistics support for digital weapon systems. Standardized, modular, automated software support tools are needed at each Air Logistics Center (ALC) to improve the current support. Modular enhancement of the support capability must be accomplished to take advantage of Embedded Computer System (ECS) and support technology advancements. The human interface must allow for a skills hierarchial approach to software development and support. This approach will allow the maximum appropriate mechanization of the support process needed to provide for minimum use of critical technical experts and maximum use of automated processes controlled by technically lower skilled personnel. The proliferation of support tools, support languages, models, simulators, etc., must be replaced by standardized tools that will allow maximum sharing of both machine and human resources. Support tools must also consider security, user priority, and backup capability. Configuration management and documentation of changes must be an automated product of the design and change process. Software simulation tools should be designed to meet AFLC support needs. The problem analysis process must be aided by ECS modeling, and coding must be kept at a human efficient level. The time required for redesign and corrective actions must be kept to minimum. Four technology areas address these needs. They are: (a) Standard Programming Languages and Support Tools: (b) Modern Software Development/Test/Maintenance Facilities; (c) Avionics Integrated Support Facilities (AISF); and, (d) System Test and Maintainability . Each area will be presented separately and the information will include background and trends.will include background and trends.

a. Standard Programming Languages and Support Tools

The objectives of this technology area are to provide modern programming languages and support software tools which will result in software maintainability, reliability, efficiency, higher programmer productivity and lower life cycle costs. State-of-the-art techniques in this area include software developments in High-Order-Languages (HOLs), structured programming concepts and techniques, and specific support tools. Modern HOLs permit the development of modular, structured and readable code. This results in improved maintainability and lower programmer training costs with resulting lower life cycle costs. The Air Force has specified that JOVIAL J73 (as defined in MIL-STD-1589B), shall be used for ECS software developments. The DoD has designed a new proposed language standard, Ada. Ada incorporates many state-of-the-art features such as promoting structured, modular developments, strong variable typing, and parallel processing facilities.

The laboratory JOVIAL J73 language development efforts have been completed. The delivered compilers are hosted on the AFWAL DEC-10 and the ASD ITEL (IBM 370) computers and include code generators for the MIL-STD-1750 and MIL-STD-1750A Instruction Set Architectures. The DEC-10 compiler is being widely used for avionics executives, mission software and support software J73 developments. Both compilers are being transitioned to a large number of outside agencies. The support software tools for 1750A are also hosted on both computers, are in use, and are being transitioned. These include an assembler, linker, and simulator. A program to provide maintenance and update of the compiler and these support tools will be continued through FY 1984. Additional efforts are in progress to upgrade the support tools to provide the extended memory capabilities of MIL-STD 1750A.

It is anticipated that this technology area will be of increasing importance as major software developments or transitions to the Ada language are made. Because of the trend toward mini and micro-processors, specialized subsets of HOLs and/or support software tools may be needed to support these technologies. Beyond Ada, HOLs may emerge as some form of design languages or "super" HOLs which require little or no user software background.

b. Modern Software Development/Test/Maintenance Facilities

The objective of this area is to provide a modern software development, maintenance, and test environment which supports avionics related software developments throughout their life cycle. This software environment is expected to result in increased software maintainability, reliability, efficiency, higher engineer and programmer productivity, greater management visibility and control, and reduced software life cycle costs.

The increased use of ECS in modern DoD weapon systems has brought about a direct increase in the operational capabilities of these weapon systems, along with an increase in their operational flexibility. However, this increased use of ECS has also resulted in a corresponding increase in the amount of software and consequently higher acquisition and support costs for these weapon systems.

Within the DoD, standardization of computer architectures and languages is helping to reduce the long term ECS costs. Additional significant reductions can be made in the costs associated with ECS software support. These savings result through the use of modern software development, maintenance, and test facilities which automate and coordinate software life cycle activities and processes.

The Integrated Support Software System (ISSS) Avionics System Analysis and Evaluation Laboratory (AVSAIL) was initiated in late FY81. The ISSS provides a modern software development, maintenance, and test environment which supports throughout their life cycle avionics software projects of all sizes. The ISSS also provides an automated configuration management system. This provides management with increased visibility into the software life cycle and control over the developed software.

c. Avionics Integration Support Facilities (AISFs)

The object in this area is to provide insight and solutions in the support of initial avionics systems. The support includes system design, development, simulation, integration, test and evaluation, installation, modification, and enhancement, and reintegration for both avionics hardware and software. This integrated facility must be capable of: (1) dynamically interfacing and stimulating avionics hardware and software; (2) providing Heads-Up-Displays, Radar and other cockpit displays plus have the capability to display an out-the-window scene for pilot reference and testing; (3) interact with MIL-STD-1553B avionic digital fiber optics data busses; (4) have generic simulation models and hardware interfaces capable of reconfiguration; (5) have a performance monitoring capability to evaluate data bus traffic, timing profiles and internal operations; (6) allow classified and unclassified processing; (7) be expandable to meet new avionic system requirements; (8) modify, comprehensively test and integrate both hardware and software; (9) evaluate man/machine interfaces; (10) keep the weapon system current; and, (11) provide data reduction and analysis equipment to address flight test data. The Avionics System Analysis and Integration Laboratory (AVSAIL) incorporates the basic features required in an AISF.

Real-time simulation sensor models are being developed using standard programming techniques and standard interfaces to allow a large model data base. From this data base an avionics system can be reconfigured in the lab, tested and evaluated prior to installation. To support the concept of an AISF for avionics systems the simulation sensor models are only one portion. Cockpit and out-the-window displays for pilot reaction and test engineer evaluation comprise the most significant interface to the man. Out-the-window scenes must provide to the "pilot" the necessary cues for flight. Additionally, the Heads-Up-Display, radar and FLIR displays must be provided. An extensive data base is required to generate these displays. Algorithms are being designed to allow the use of Defense Mapping Agency data as the basis for out-the-window displays, radar, and FLIR. Attempts to combine terrain, cultural, weather, and threat data bases will proceed when the terrain problems are solved.

To ensure the accuracy and dependability of the AISF, considerations must be given to diagnostics and control in the hardware area and software/simulator quality assurance for the software. To complete the AISF other areas of consideration are support software tools, support computer architecture and data reduction and analysis software.

d. System Test and Maintainability

Studies indicate that operations and support costs consume a major portion of the total ownership costs of an Air Force weapon system. Studies have also shown that the time required by maintenance personnel for testing and fault isolation of avionics equipment comprises between 55-63% of the total maintenance time. Specific emphasis and developmental efforts in the area of maintenance testing at all levels may reduce operational expenditures. However, a decrease in support equipment must be partially offset by increasing system Built In Test (BIT) complexity.

A major effort in the area of avionics maintenance improvement has been started. This effort under the PAVE PILLAR program (PE63253F) will culminate with development, demonstration, and flight-validation of an on-board avionic Integrated Testing and Maintenance (ITM) system. In particular, this ITM system will exploit the benefits of advanced test and maintenance techniques including: Kalman filtering of multi-sensor information, signature analysis, and self-checking. In support of this program, the Avionics Laboratory has initiated two separate efforts aimed explicitly toward the exploration and development of on-board ITM concepts. The first effort is Integrated Testing and Maintenance Technologies. The prime objective of this effort is to develop on-board ITM methodologies compatible with digital avionics architectures possessing control and distributed intelligence. The second is Advanced System Level Test Techniques. This effort is targeted exclusively toward the exploration/ evaluation of advanced system level test techniques to be applied either in conjunction with or independently of conventional BIT techniques.

CHAPTER FOUR

LOGISTICS SUPPORT

4.1 INTRODUCTION

Logistic support considerations for systems/equipments are closely related to and impacted by design decisions made early in the development acquisition process. Thus, logistics emphasis is continually shifting toward earlier life cycle phases. The future will see efforts leading to refinements in techniques and procedures to more effectively demonstrate and assure support concerns are designed into systems/equipments. Logistics philosophies must keep pace with rapid evolution of avionics technology. From both a cost and performance viewpoint, the avionics community cannot afford to rely on 1960 logistics concepts in a 1980-1990 technology world.

4.2 TECHNOLOGY THRUST

A significant portion of this technology growth has occurred in the advance of digital systems and the associated software/firmware. It is estimated that the Air Force will have over 170 embedded computer systems (ECS) by 1985; have an inventory of some 50,000 computer systems programs growing at an estimated rate of 6,400 packages per year; and that there are 400-500 identifiable automated test equipment systems of which 20-30 are particularly active.

This growth in utilization of ECS and other computer systems has seen a dramatic shift in acquisition and support cost of hardware versus software. Figure 4-1 depicts how this relationship changed.

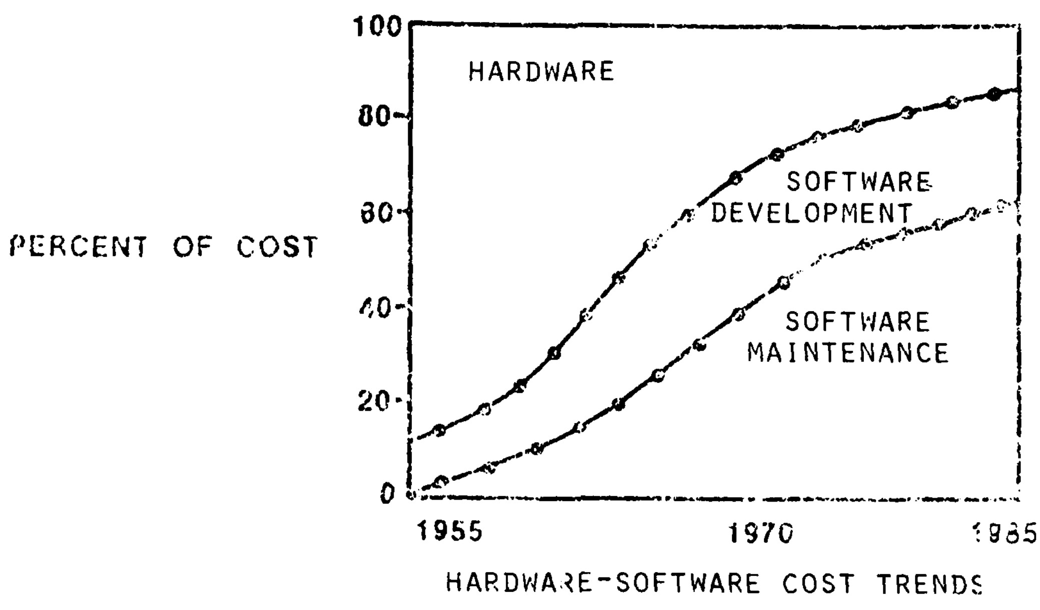

Figure 4-1

In recognition of and response to these changes, AFLC has invested considerable money in establishing and manning software support facilities at each Air Logistics Center. A positive result of advancing technology on the logistics posture has been an increase in the reliability of systems and equipment. Figure 4-2 presents this gain on several families of equipments.

The impact on the total avionics suite, however, is less dramatic and is a reflection of the size and complexity of the total suite. Figure 4.3 shows time-to-repair trends associated with the system/equipment reliability trends.

Although there appears to be insignificant improvement, this trend will be more meaningful in spite of hardware sophistication by increasing awareness of reliability, testability, and maintainability design. Several activities are now on-going to help in this regard. Efforts are being expended to develop system and equipment engineering reliability design handbook; to investigate and recommend testability improvements; and to evaluate maintenance philosophies and concepts. All of these efforts recognize the necessity to do the job early in design and do it well.

The accelerated use of high technologies in emerging weapon systems requires a greater recognition of the operational impact created by their use and subsequent supportability impact on the USAF Metrology and Calibration (METCAL) Program. The scheduled acquisition of new weapon systems which are critically dependent on new technologies, coupled with modifications to existing systems, poses a significant near-term challenge to the USAF METCAL program. The management strategies (two level vs three level maintenance concept) will also impact the USAF METCAL program's ability to provide required support. The criticality of metrology to logistics support requires increased emphasis be taken for modernization and expansion of calibration and repair facilities; the acquisition of high technology hardware and software coupled with additional trained manpower resources are needed to support future METCAL demands. Through increased funding during the initial acquisition phases, these challenges can be met successfully.

4.3 LOGISTICS NEEDS/THRUSTS

To assist in meeting the challenges facing the logistics community in coping with the dynamics of high technology infusion in weapon system acquisitions, the Air Force Coordinating Office for Logistics Research (AFCOLR) at Wright-Patterson AFB OH has developed a compendium entitled, "Air Force Logistics Research and Studies Program." This document provides the Air Force logistics community with a new perspective on the area of Air Force logistics research and studies. It provides a method for top level management in both the Air Force and defense-related industries to review the logistics longterm planning process with respect to ongoing and projected logistics research and study efforts. This document highlights actions proposed or underway for bringing about the application of new technology for significant logistics purposes. Examples of these actions are as follows:

<u>Accelerated Reliability Testing - 18007</u>

The objective of this logistics need effort is to develop accelerated reliability testing methods to be used for electronic testing.

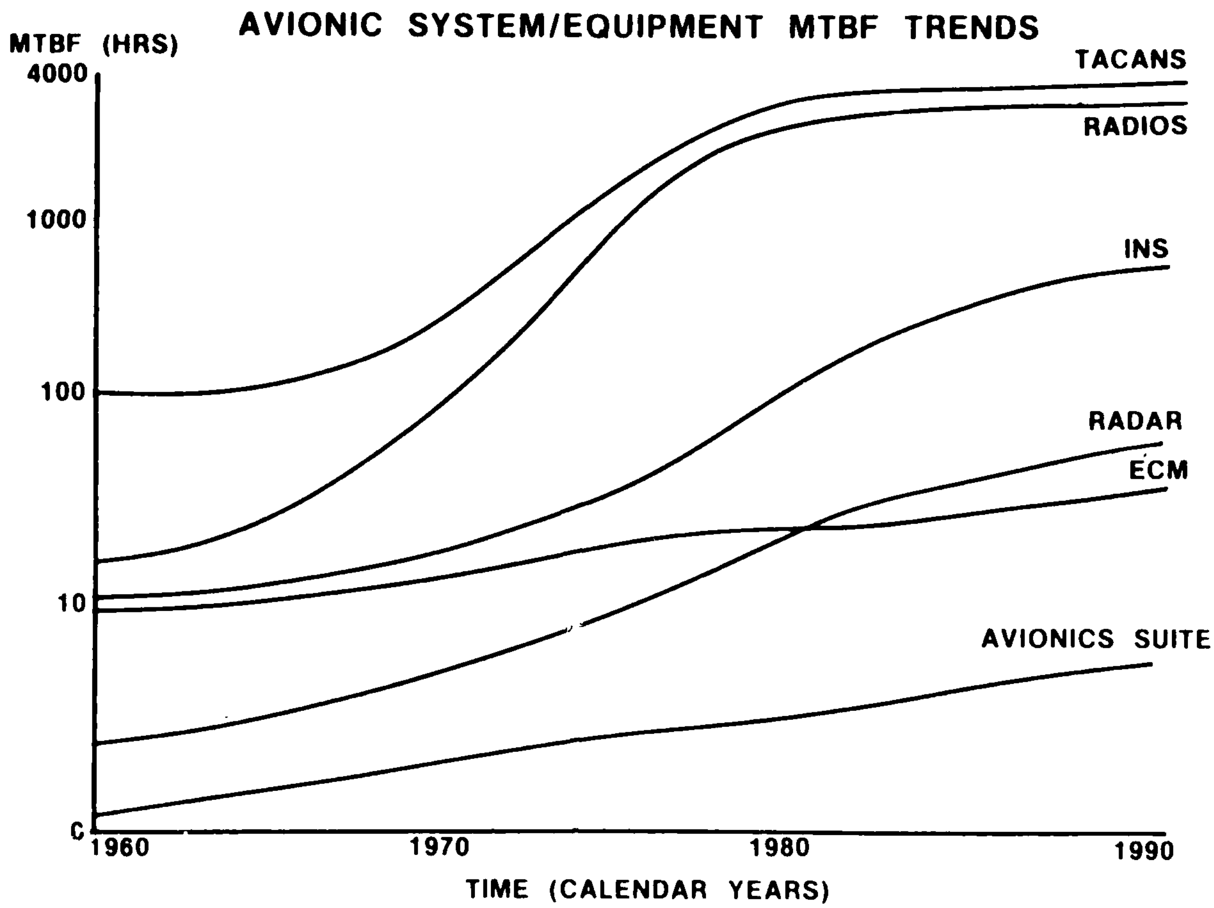

FIGURE 4-2

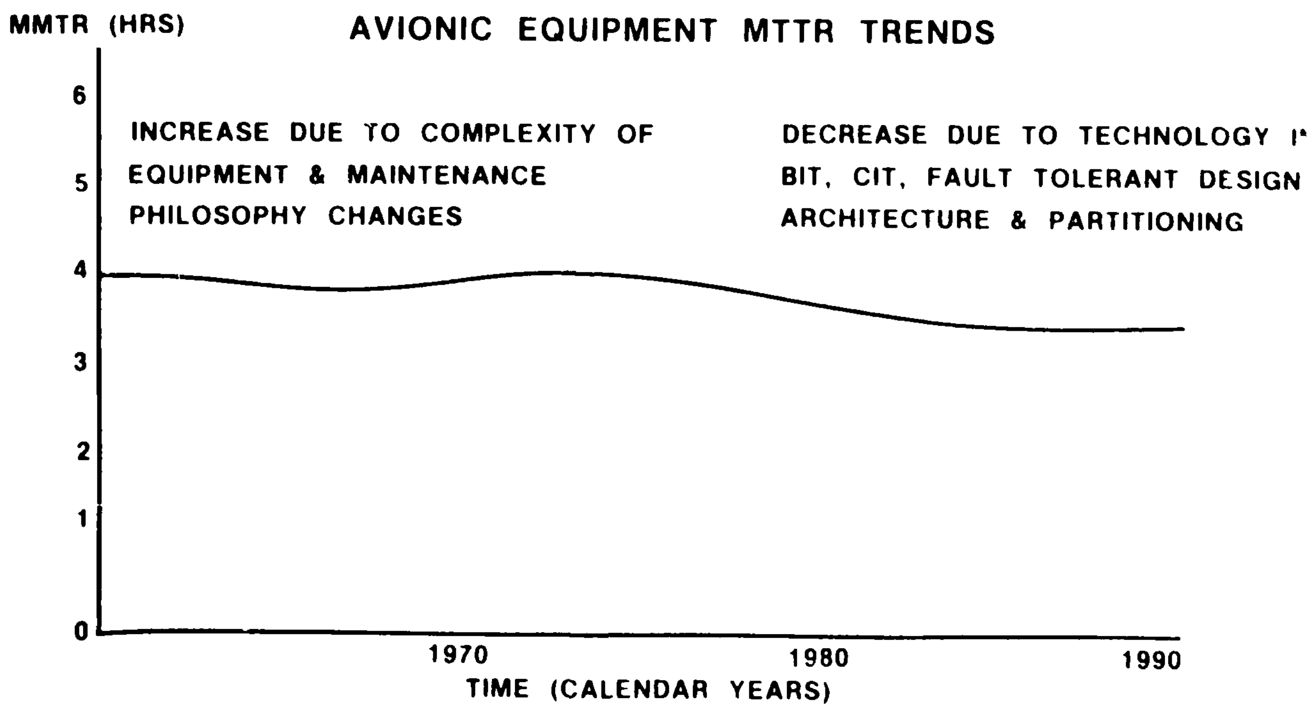

FIGURE 4-3

The present reliability testing methods are "real time" and testing high mean-time-between-failure required solid state equipment to MIL-STD-781C specifications require long lead times. The costs for these long running tests are unnecessarily high.

The approach to resolve this problem will be to develop accelerated testing methods consistent with the present requirements of MIL-STD-781C. In addition, combined Environmental Reliability Test (CERT) Laboratory facility will be used to verify testing methods. An example of this type of testing is to develop generic testing techniques which reduce time with respect to environmental conditions which will verify equipment reliability.

This logistics need effort will help minimize operations and support costs by identifying reliability problems earlier in the life cycle of equipment by effecting the necessary design changes before production commitment. Savings will come from decreased need to retrofit and increased equipment reliability.

<u>Design Considerations Which Impact Levels of Maintenance Support in Avionics Systems - 180079</u>

The purpose of this program is to determine design specifications and guidelines which would enable us to obtain 100 percent fault detection/ fault isolation in advanced avionics systems.

Design guidelines are required for developing technical analysis techniques which would aid in making projections for maintenance level assessments of avionics systems. Design practices which integrate testability are required which consider the use of fault detection, fault isolation, system integrated testing, and flight line test equipment.

The following areas will be investigated in this logistics need effort:

- Advancements in System Integrated Test
- Advancement of Fault Detection/Fault Isolation Techniques
- Projections of Impact of Flight Line Maintenance Test Equipment
- Projections of Impact on Design of Automatic Test Equipment
- Projections of Software Support Requirements Needed in Advanced Systems

This effort will develop policy guidance for establishing levels of Maintenance of Avionics in the 1990s.

<u>Environmental Control System for Sophisticated Electronic Equipment - 181058</u>

The objective of this logistics need effort is to establish environmental design guidelines for electronic maintenance facilities that are compatible with energy conservation guidelines.

No guidelines or policies exist to aid facility designers in the design of facilities or environmental control systems used for repair of sophisticated electronic equipment. Without these guidelines, facility designers are often unable to justify the expensive environmental control systems in new facilities. In addition, lack of guidelines may cause overdesign creating unnecessary and expensive energy bills.

A series of guidelines for designing facilities adaptable to environmental requirements of modern electronic equipment is needed. These guidelines would result in the development of more efficient and effective repair facilities for avionics equipment.

Improvements in Traveling Wave Tubes - 179027

The objective of this logistics need effort is to reduce procurement and logistics support costs of traveling wave tubes through standardization, improvements in design and production, and design to facilitate repair.

Traveling wave tube costs are extremely high and steadily increasing. Traveling wave tube production is essentially a hand-assembled or manual operation; many traveling wave tubes cannot be repaired due to peculiar designs. There is a need for traveling wave tube standardization to reduce the proliferation of different types of traveling wave tubes.

The suggested approach to resolve this problem is to extend existing research and development efforts to include consideration of the problems identified with this logistics need. Efforts in PEs 62204F, 63203F, and 63718F should be extended.

The result of resolving this problem will be reduced cost and improved support of traveling wave tubes through standardization and better design.

Logistics Support Considerations Associated with Fiber Optics Materials and System Specifications - 180001

The purpose of this logistics need effort is to determine the logistics support considerations associated with fiber optic materials and system specifications.

Fiber optic materials are becoming increasingly popular in military applications. The technical aspects of these materials have won enthusiastic support from the engineering communities; however, the logistical impacts of fiber optics usage have not been examined and reported. This task would permit laboratory exploration at logistics support considerations that should be assessed in accepting the use of fiber optics for systems applications.

The approach to resolve this concern would be to conduct comprehensive research with industrial suppliers and known government using activities and make logistics assessments. Research may disclose other factors which have

a bearing on material acceptability for system application. If so, such information/data should be reported:

- Maintainability and reliability predictions, i.e., MTBF, MTTR, of fiber optic materials and components.

- Support and test equipment required for maintenance should be identified.

- Technical compatibility of proposed system components, i.e., source modulators, optical detectors, etc., with fiber optic cabling.

- Technical skills required for maintenance should be identified.

- Comparison of initial acquisition costs versus operations and support costs.

These efforts would result in an early-on assessment of logistics advantages/disadvantages that must be weighed before adoption of fiber optics.

Nuclear Hardness Surveillance Techniques - 181118

The reason for this logistics need effort is to develop a method for testing nuclear hardened systems to measure the systems' vulnerability to nuclear effects.

Many new weapon systems are designed, built, installed, and tested to survive nuclear effects. However, no capability exists at any level of maintenance to determine that the designed nuclear hardness is not degraded, especially whenever maintenance actions are performed on the installed weapon system.

A method to resolve this problem would entail the identification of areas where hardness surveillance can be accomplished and the development of techniques and procedures needed to perform such a task.

The completion of this effort would enhance the readiness of USAF aircraft to perform their designated missions in a nuclear environment.

Tradeoff Among Trained Manpower, Automatic Test Equipment, and Technical Data 179014

The purpose of this logistics need effort is to investigate the tradeoffs between the levels of complexity of Automatic Test Equipment and the levels or types of comparable human maintenance capabilities within field, intermediate, and depot maintenance.

There is a growing trend toward increased usage of automatic test equipment. This trend is expensive and somewhat degrading to maintenance personnel who believe that their skills are not being used to the fullest. It is hoped that a greater integration between maintenance personnel and automatic test equipment will reduce costs and improve maintenance efficiency as well as sustain maintenance as a viable career field.

The approach to resolve this problem should encompass the identification of the advantages/disadvantages of increased use of Automatic Test Equipment at different levels of Air Force maintenance. Determine what levels or types of training, skills, and technical data are required to allow maintenance personnel to interact with Automatic Test Equipment, thereby improving maintenance efficiency while reducing overall costs.

Completion of this logistics need effort should enhance productivity within AFLC and increase support efficiency. Human and machine interfaces can be optimized using the results of this study.

4.4 CONCLUSION

Continuation of the trends discussed above and the required concomitant actions are dependent on increased funding early in the program cycle rather than in the later stages. The question ultimately is not can the Air Force afford this approach but can the Air Force afford not to take this approach. The force multiplier effect, made available through support logistics improvements, is critical to the effectiveness of new systems which are often affordable only in limited quantities. Trends show we are moving in a good direction; however, movements are slow considering the rapid changes in technology. Most improvements tend to impact mid to long term time frames. The immediate future will require constant management attention to help keep logistics support affordable.

CHAPTER FIVE
AVIONICS INVESTMENT STRATEGY

5.1 INTRODUCTION

The purpose of this chapter is to present an overall avionics investment strategy. Investment strategy includes all the activities related to budgeting funds for a program and is reached through the requirements, planning, programming, budgeting and other program decision-making processes. When viewing the entire Air Force spectrum of Avionics, investment strategy becomes the sum of all the individual program investment strategies. The strategies in this chapter consist of the current avionics baseline programs and considerations for making future refinements to the baseline. The baseline programs are summarized in annexes A, B and C. This chapter is outlined to include discussions of general investment strategy considerations, an avionics functional area perspective of the investment strategy and a funding perspective.

5.2 GENERAL INVESTMENT STRATEGY CONSIDERATIONS

The primary purpose of this investment strategy is to support the objectives outlined in chapter 2. The fundamental overall objective is greater combat effectiveness. A closely related objective, also with investment strategy implications, is to achieve this improved combat effectiveness within an acceptable schedule. Detailed descriptions of specific avionics needs are provided in chapter 2.

A fundamental concept in the evolution of this investment strategy is the necessary linkage between related and overlapping plans. This AMP will not duplicate the supporting analyses or level of detail in these related plans. However, the AMP strategy must be responsive to and compatible with the thrust of these planning initiatives. Related plans cover the areas of C^3, EC, mission area plans including Vanguard, weapon system/modification plans and laboratory technology plans. An important illustration of this concept is the weapon system modification plans. Force structure decisions are outside the scope of this AMP. However, the avionics investment strategy should include weapon system upgrade alternatives which address both subsystem and architectural considerations. Similarly, effective weapon system planning will enable more effective avionics planning. The desired outcome is a compatible and mutually supportive planning process which will meet the objective of greater combat effectiveness.

There are a number of factors or "drivers" which influence the investment strategy in addition to the needs previously discussed. Some of these are listed in Table 5-1. These factors can be roughly grouped into the categories of constraints and status. Constraints cover a broad spectrum from funding levels and type of funds available, to a variety of policies which govern the way we do business. Some of these policies are discussed in chapter 2 under "Acquisition Guidelines". Funding will be a subject for further discussion in this chapter. The status of existing systems and equipment, existing programs and related plans have a major influence on the investment strategy. These

FACTORS AFFECTING AVIONICS INVESTMENT STRATEGY

- CONSTRAINTS
  - TOTAL FUNDING AVAILABLE
  - TYPE OF FUNDS AVAILABLE (6.2, 6.3, 6.4, 3010)
  - DEGREE OF CURRENT EMPHASIS ON READINESS VS ACQUISITION VS DEVELOPMENT
  - DEGREE OF CURRENT EMPHASIS ON COOPERATIVE PROGRAMS WITH OTHER SERVICES AND/OR NATO
  - OTHER POLICY GUIDANCE
- STATUS
  - EXISTING SYSTEMS AND EQUIPMENT - THEIR CAPABILITY AND SUITABILITY FOR MODIFICATION OR REPLACEMENT
  - CURRENT PROGRAM STATUS (FUNDING SUFFICIENCY, SCHEDULE AND TECHNICAL PERFORMANCE)
  - STATUS OF AVIONICS ISSUE RESOLUTIONS
  - RELATED PLANS/INVESTMENT STRATEGIES
    - TECHNOLOGY PLANS, INCLUDING AFWAL MAJOR TECHNOLOGY THRUSTS
    - FORCE STRUCTURE PLANS (INCLUDING MASTER MOD PLANS/MSIPS)
      - STRATEGIC - B-52, FB-111, B-1B, ATB
      - TACTICAL - A-10, F-15, F-16, F-4 MODS, F-15/F-16 DERIVATIVES, ATF
    - VANGUARD PLANS (MISSION AREA AND FUNCTIONAL AREA)
    - VARIOUS FUNCTIONAL AREA PLANS - EC, C^3, NAV

TABLE 5-1

factors can have a greater influence on the actual spending profile than the avionics needs previously discussed in chapter 2. Some of these influences are stabilizing and have an overall desirable effect on avionics programs. For example policy guidance and related plans go a long way toward providing appropriate direction for an avionics investment strategy. On the other hand an overly restrictive budget, unresolved issues and other difficulties can disrupt an otherwise well conceived program. An important aspect of planning and implementing the avionics investment strategy is to assure that these negative influences do not distract significantly from the primary objective of improved combat effectiveness. The guidance and planning reflected in chapters 2, 3 and 4 and these factors should be considered in the process of developing and implementing an effective avionics investment strategy.

Effective implementation of an avionics investment strategy involves corrections to ongoing programs as well as the above planning considerations. Table 5-2 and 5-3 list typical avionics program changes and supporting rationale. These types of changes are frequently applied well into a program's life cycle.

The dimensions of the total avionics investment strategy cover a broad spectrum. All types of funding are involved including 3010 (production), 3400 (support) and 3600 (RDT&E). This investment strategy discussion will focus on RDT&E funding including 6.2, (exploratory development), 6.3 (advanced development) and 6.4 (engineering development); and 3010, P1100 (class IV and V modifications). These funds are managed by many organizations within the Air Force including laboratories and product divisions within AFSC and modification managers throughout AFLC. Some funds are provided for joint ventures with other organizations. The VHSIC and PAVE MOVER radar programs are examples of this. The nature of these avionics programs includes "quick fixes" to achieve desired improvements in the near term (FY83-87), evolutionary improvement of existing aircraft avionics systems with both near and mid term impacts (FY83-92); and revolutionary changes with impact in the mid and far term (FY88-97). The aircraft impacted by this strategy will include many existing aircraft (class IV and class V modifications), derivatives of existing aircraft (F-15 and F-16 currently under consideration) and next generation tactical and strategic aircraft (ATF and ATB). Existing plans for both development and production (including modifications) include relatively firm plans where there is a solid commitment to proceed and sufficient funding to accomplish the task. These plans also include programs that are highly uncertain from the standpoint of available funding in a constrained fiscal climate. Table 5-4 summarizes the relationship between several of these investment strategy considerations and the type of funds utilized.

Another important aspect of investment strategy is to improve the timeliness of planning, programming, budgeting and management activities in response to avionics needs. These implemenation steps cover all activities from initial planning efforts through IOC. A valid investment strategy concern for all ongoing programs is that sufficient funding be provided for timely accomplishment of the program objectives. However, the emphasis on improved timeliness is not focused on ongoing programs alone. Rather, the emphasis is on more timely planning and coordination at all levels in the Air Force so that programs can start sooner or transition to the next phase sooner. Issues must be resolved sooner, front end funding must be identified and provided sooner, PMDs must be prepared and issued sooner and program management activities must respond with earlier contract awards. These activities which take place prior to initial

AVIONICS PROGRAM CHANGES

SCHEDULE	• ACCELERATE • CONTINUE AS IS • DELAY

COST	• CHANGE SCOPE
	  • DELETE
	  • REDUCE
	  • INCREASE
	• ALLOCATE TO ANOTHER PE/PROJECT

TECHNICAL	• CHANGE EQUIPMENT SPECIFICATIONS

TABLE 5-2

RATIONALE FOR AVIONICS PROGRAM CHANGES

- RESPONSIVE TO EXISTING/CHANGING OPERATIONAL REQUIREMENTS
- ACCELERATES AVAILABILITY OF HIGH PRIORITY SYSTEMS
- ENHANCES READINESS AND SUSTAINABILITY
- REDUCED COST
  - DEVELOPMENT
  - ACQUISITION
  - SUPPORT
  - LIFE CYCLE COST (LCC)
- SHORTEN ACQUISITION TIME
- ENHANCE STANDARDIZATION
- IMPROVES PROGRAM MANAGEMENT/COORDINATION
- IMPROVES TEST/SUPPORT FACILITIES
- STRENGTHENS INDUSTRIAL BASE
- REDUCED RISK
- BUDGETED FUNDS FOR TECHNICAL RISK
- IMPROVED AVAILABILITY OF EXISTING SYSTEMS
- IMPROVED SURVIVABILITY
- IMPROVED SOFTWARE AND/OR HARDWARE SUPPORT

TABLE 5-3

TABLE 5-4 - GENERAL AVIONICS INVESTMENT STRATEGY CONSIDERATIONS

FACTOR	TYPE OF FUNDING UTILIZED FOR AVIONICS INVESTMENT					
					3010(P1100)	
	6.1	6.2	6.3	6.4	CLS V	CLS IV MOD
Typical Funds Per Effort	10K	100K-2M	500K-10M	1M-100M	10M-500M	1M-200M
Probability of Success	.1	.25	.4-.7	.95+	.99+	.99+
Number of Alternatives Investigated	Many	Several	Few - Typically 2 or less	Single Approach	Firm Baseline Configuration	Firm Baseline Configuration
Number of Contractual Efforts	Several	Few	Typically 2 or Less	Single (Unless Dual Development)	Single	Single
Typical Duration Per Effort	1 Year or Less	1-4 Years	2-5 Years	3-7 Years	3-7 Years (Incl Repeat Buys)	3-7 Years (Incl Repeat Buys)
Degree of Competition	Open	Multiple Candidates	Multiple to Few Candidates	Few Qualified Candidates	Normally Single Qualified Candidate	Normally Single Qualified Candidate
SONS Supported	Undefined	Multiple (But Not Specified)	1 or More Identifiable SONS	Specific SON(S) Identified	Specific SON(S) Identified	SONS Not Required but Sometimes Supported
Aircraft Application	Undefined	Multiple (But Not Specified)	Aircraft Candidates Identifiable	Specific Aircraft Usually Identified	Initial Aircraft Applications Identified Before Go Ahead	Initial Aircraft Applications Identified Before Go Ahead

TABLE 5-4 (CONT.) - GENERAL AVIONICS INVESTMENT STRATEGY CONSIDERATIONS

FACTOR	TYPE OF FUNDING UTILIZED FOR AVIONICS INVESTMENT					
					3010(P1100)	
	6.1	6.2	6.3	6.4	CLS V	CLS IV MOD
Primary Thrust	Basic Research - Concepts - Ideas	Exploratory Dev - Brass-board Demon-stration	Advanced Dev - Sys/SubSys Performance Demo - Hot Bench - Flight Evaluation	Engineering Dev - Formal Qual - Producible - Production Configuration Established	- Production (GP A&B) - Installation	- Production (GP A&B) - Installation
IOC Period (Near, Mid, Far)	Far Term & Beyond	Far Term	Mid/Far Term	Near/Mid Term	Near Term	Near Term
Responsible Organization	- Universi-ties - Labora-tories	Laboratories	- Laboratories - XR Cadres	Product Division(s)	- Product Divisions - ALCs	- Product Divisions - ALCs

obligation of funds contribute significantly to the current long lead time. A more closely integrated approach to the planning and implementation phases can reduce this time considerably.

A major contributor to effective investment strategy implementation is timely, effective transition from 6.3 to 6.4 program. This is critical for timely application of component technologies such as VHSIC, but is equally important for timely accomplishment of total system integration tasks associated with emerging architectures (MIL-STDs-1553, 1750 and 1589) and subsystem integration concepts such as ICNIA. Planned transition with overlaping 6.3 and 6.4 efforts will be essential to develop timely advanced configuration options for current aircraft upgrade programs as well as timely demonstration programs in advance of the full scale development phase for the next generation aircraft. The approach is not to add further complexity to the advanced development and engineering development tasks. Rather, timely technology transition calls for a closer orchestration between the two phases of development and sufficient overlap to preclude unnecessary time delays. A concerted effort to reduce the time associated with initial implementation steps and technology transition will produce a significant reduction in administrative lead time.

5.3 AVIONICS FUNCTIONAL AREA PERSPECTIVE

This section consists of investment strategy discussions of each of nine avionics functional areas - Communications, Navigation, Identification, Systems Integration, Controls and Displays, Flight Control, Electromagnetic Combat, Target Acquisition/Strike and Reconnaissance.

COMMUNICATIONS

The first objective of the Air Force investment strategy for the airborne communications area is to retain or augment those funds currently budgeted. Redirection of funding is being considered, but the overall goal of antijam (A/J) secure voice communication for tactical and supporting forces is paramount and unchanging. The goal of improved C^2 connectivity for strategic operations is also receiving increased emphasis. This emphasis is supported by increased funding in strategic C^2 programs and the new Military Stragetic, Tactical and Relay System (MILSTAR) program, which is planned to address both strategic and tactical needs. Key program elements addressing both strategic and tactical voice communications needs are shown in Table 2-3.

HAVE QUICK development is essentially complete with limited production installs currently being made in selected TAF combat coded aircraft. There is a current contract for additional quantities, bringing the total to in excess of 5,000 units. The alternative of continuing upgrade of this radio over the next decade to provide incremental improvement in A/J capability while remaining within the ARC-164 form factor for ease of retrofit will be pursued on a continuing basis. This option is especially important if current issues surrounding antijam communications delay early implementation of a more robust capability.

The orginal SEEK TALK program is undergoing significant change. The full scale development contract that was awarded in February 1982 was terminated in August 1982 at the direction of congress. Funds for studies for alternative options were approved for FY82 and 83. The Air Force was required to conduct studies to establish an architecture for antijam communications, antijam data and combat identification. These studies were to be reviewed by the DSARC in January 1983 and reported to congress in March 1983. Based on congressional approval of the recommended architecture, it is anticipated that development funds will be released. Current/previous programs (and related investment strategies) which will be impacted by the new architecture include SEEK TALK, JTIDS and Mark XV IFF.

NAVIGATION

The navigation investment strategy consists of broad application of the standard INS for near-term applications; rational application of GPS, ICNIA and/or improved accuracy INS alternatives in the mid/far terms period; and phase in of the Microwave Landing System (MLS) in the far term period. MLS development efforts will occur primarily in the mid term with initial planning and coordination among the services and NATO in the near term. Key program elements supporting this strategy are shown in Table 2-3.

A principle concern with dependence on GPS for mid/far term navigation requirements is funding support for the total system in a constratined budget situation. GPS has not competed effectively for funds in previous POM cycles, though congressional Committee support for GPS has improved recently. This support is based partially on a plan for sharing costs through assessment of user fees. This strategy supports GPS to the extent considered appropriate by the users, and to the extend that it is affordable within the current limited budget. ICNIA is an additional alternative concept for potential mid/far term cooperative navigation system applications.

Additional desired alternatives/enhancements to the current baseline navigation strategy for the mid/far term include: 1) Development of a high accuracy INS (approximately .001 N.M/Hr CEP); 2) Develop gravity anomoly models as an INS sub-rountine concurrently with high accuracy INS development; 3) Develop instruments and software to reduce INS reaction time to two minutes in the gyro compass (GC) mode; 4) Develop mechanization so the pilot need not pay attention to INS turn-on and alignment; 5) Develop accelermoters for use in strap-down systems; 6) Develop high A-J simple install antennas for JTIDS-GPS-ICNIA type applications and; 7) Design navigation systems for two levels of maintenance. Instruments and gyro technology are within the desired threshold to support this strategy, however, limitations are imposed by lack of an installed gravity model. Such data may be available and, if exploited, would provide desired accuracy. The present INS reaction time of 8-20 minutes in the GC mode is too long for operational use. Other desired improvements listed would reduce crew workload, maintenance workload and equipment cost.

Additional 3010 funding is required to fully exploit the benefits of the standard INS program in the near term and GPS in the near/mid term and beyond. Additional 6.4 funding would be desirable for GPS user equipment integration for force wide application and for improved schedule. Some additional 6.2 and 6.3

funding to support the mid/far term strategy is desirable. However, this strategy can be pursued initially within the current baseline 6.2 and 6.3 funding profiles. Substantial production funding will be required in the far term for MLS implementation. Full scale development costs for MLS will be shared with the Army and Navy.

IDENTIFICATION

The IDENTIFICATION investment strategy consists of near-term Mark XII IFF improvements, near-term non-cooperative BVR-ID systems for BVR missile employment, a far term cooperative identification system (Mark XV) planned for interoperability in the NATO environment, other classified projects, and technology base efforts providing cooperative, non-cooperative and multisource integration technologies. Key program elements are reflected in Table 2-3.

Although the Combat Identification System Program encompasses many types of target identification components and techniques, a primary thrust is a NATO interoperable question - and answer IFF subsystem. In a 9 June 1981 memorandum to the Assistant Service Secretaries, the Assistant Under Secretary of Defense for Research and Engineering stated: "NATO has established, and the US has endorsed, an urgent requirement for a significantly improved combat identification capability. A US program to participate in the development of the NATO Identification System was initiated by January 19, 1979, USDRE memo, and a commitment has been made to NATO to select a design standard no later than December 1981, so that the nations can enter the hardware development phase in 1982. I view this program to be of very high priority and have assured my counterparts in NATO that we are prepared to devote the necessary resources to maintain the agreed upon schedule. It is, therefore, essential that sufficient authority, manpower and service representation be provided to the Combat Identification System Program Office to execute this important program and fully meet our international commitments."

While the design standard has not yet been established, considerable effort is going into studies and analyses associated with alternative Mark XV approaches. The Mark XV was considered, along with SEEK TALK and JTIDS, in a Tri-Service Antijam Communications Architecture Steering Group evaluation of alternative approaches to obtaining DOD and NATO interoperability in A/J communications. This subject is also addressed in the COMMUNICATIONS discussion. A Tri-Service Aircraft Identification Working Group (AIWG) was established to integrate ID requirements and define alternative programs. The results of the AIWG effort are under evaluation by AFSC, with TAF support, to formulate an ID investment strategy for AMRAAM and Mark XV.

CORE AVIONICS STRATEGY

The Core Avionics Strategy encompasses three avionics functional areas: System Integration, Controls and Displays and Flight Control. The core strategy is structured in this manner to address the trend in avionics toward more integrated subsystems and to capitalize on the synergism between subsystems afforded by advances in digital processing and digital information distribution. Inherent also in this trend is increased system complexity and increased demands on the system integration task which now must cope with evolving architectural standards as well as subsystem changes which will occur frequently. The thrust of the core strategy is to systematically and effectively approach this task so that the total weapon system fucntions effectively. Strategies for System Integration, Controls and displays, and Flight Control are discussed separtely in the following paragraphs.

SYSTEM INTEGRATION

Key program element/projects supporting the system integration strategy include individual aircraft PE's for new prototype aircraft or new aircraft undergoing full scale development, PE's for inventory or current production aircraft planned for modification and other programs shown in Table 2-3. The System Integration strategy supports the concept of architectural standardization and is complementary to related strategies which address individual subsystems or functional areas, but do little to address the system integration task. The technology thrusts in Chapter 3 which address System Integration, Analysis and Software Technology, and Avionics Logistic Support Technology pursue technologies which address the integration task.

The technology thrust which addresses communications, navigation, and identification avionics is an application of this concept at the subsystem/sensor level to achieve integration of the previously independent Communications, Navigation, and Identification functions. The program elements listed in Table 2-3 individually support portions of the sytem integration task. This strategy is concerned with effectively orchestrating all the contributing elements which include technology base programs, engineering development programs, hot bench facilities (laboratory, SEAFAC, prime contractor and ALC), prototype flight test programs and flight test programs supporting aircraft engineering development or modification programs. This strategy is, in effect, an approach to system integration that recognizes emerging architectural concepts, emerging subsystem concepts and the need for timely testing and evaluation of the total avionics system.

Figure 5-1 illustrates the generic approach to the System Integration strategy. Some real program elements are shown for the purpose of illustration. The on-going avionics programs include all the technology base and some of the engineering development efforts discussed in this AMP. The System definition/requirement activities include the modification plans, advanced aircraft plans/studies and other study/planning efforts which define the desired system. The open forum activities include the AAPC Panels, Controls and Displays Working Groups, Language User Groups and other activities which support evolving system/subsystem concepts and specifications. These three activities (on-going programs, system definition and open forum) operate in parallel and represent a closed loop system of planning and development efforts. These efforts support decisions concerning test objectives, testbed configurations, current aircraft versus prototype aircraft laboratory versus prime contractor/ALC hot bench, contractor versus in house engineering support and Air Force in-house organization responsibilities.

There is a considerable overlap of 6.3 and 6.4 activities during the period FY 83 through FY85 in Figure 5-1. This results from the necessity to apply new technologies to existing aircraft systems via timely technology transition and planned aircraft upgrade programs in response to user requirements. It also results from the necessity to effectively utilize existing test facility, existing contractor hot bench and existing aircraft testbed resources to support laboratory test programs. Current and projected budgets will not support several demonstration testbeds concurrently with test programs to support existing aircraft upgrades. Flight test costs have increased dramatically within

CORE AVIONICS SYSTEM INTEGRATION ROADMAP

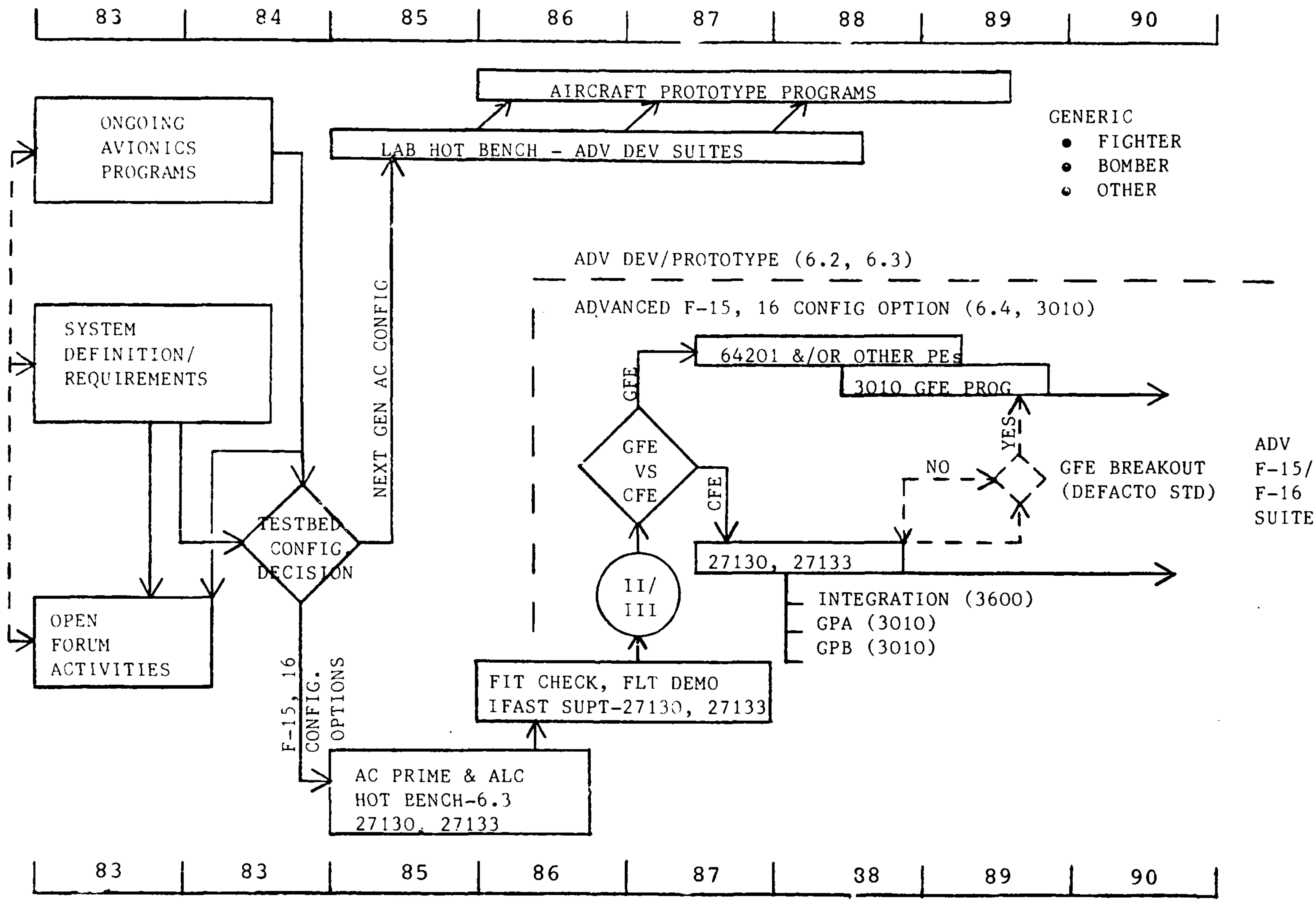

FIGURE 5-1

a relatively level budget. This has had the effect of significantly reducing available flight hours. Support for early implementation of such programs as the Integration Facility for Avionics Systems Test (IFAST) has become critically important because of flight test costs and the large menu of avionics programs ahead which will require test support. Integrated Digital Avionics (64201/2658, IDA) is another program that was initially envisioned to include a substantial in-house System Engineering Avionics Facility for engineering development programs. This concept has not been developed to the extent required to independently support planned avionics programs. Again, the basic problem has been one of funding. While we support adequate funding for facilities we must adopt strategies for use of existing government and contractor facilities. This concept of overlapping 6.3 and 6.4 efforts supports the task of rationally determining initial application of new technology based on technological maturity, early interface with key players in the next development stage (SPO engineers and Aircraft Prime Contractor Candidates), availability and utilization of test facilities and test results.

The FY 86-87 period in Figure 5-1 is characterized by a fairly clear distinction between 6.3 prototype programs and modification programs for current aircraft. However, things begin to merge again in FY 88 and FY 89 to assess the readiness of products from the 6.3 prototype programs for application in the next generation aircraft programs. It is appropriate at this point to call attention to planned prototype programs such as 63253 (PAVE PILLAR). These types of programs should be reviewed continuously to assess their structure and funding sufficiency to support derivatives of current aircraft and next generation aircraft. A key output from these demonstration initiatives is the clear distinction between technologies suitable for modification/derivative applications and revolutionary technologies required for next generation systems. The portion of Figure 5-1 that pertains to Current Aircraft modification programs, CFE versus GFE decisions and GFE programs illustrates the desired process for determining appropriateness and timing of GFE support for aircraft modification programs. Fundamental to this process is recognizing system requirements, system architecture and program funding and schedule constraints as key elements of GFE versus CFE decisions. Where GFE support cannot be implemented initially, plans should be made for early GFE breakout followed by rational application of the "defacto standard" subsystem to the original aircraft and for subsequent/concurrent applications to other aircraft. This approach to evolving standard GFE subsystems must be utilized frequently because of the difficulty in funding "stand alone" GFE developments in sufficient time to support the initial aircraft. Avionics and weapon system plans will be major contributors to timely, advanced GFE planning and sufficient "front money" to conduct optimum GFE programs.

CONTROLS AND DISPLAYS

The Controls and Displays investment strategy relates closely to the System Integration strategy. Both strategies represent an integrated systems approach to evolving future architectures and components. The objective of the Controls and Displays strategy for the near/mid term is to 1) develop a cockpit control and display architecture for safe operations using electronic color CRT displays and 2) develop production control and display components (LRUs) to use in integrated cockpits as well as for retrofit in non-integrated cockpit applications.

A strategy for systematically addressing future Controls and Displays applications in USAF aircraft is justified by the number of fragmented efforts currently underway and the potential for unnecessary proliferation of displays in future cockpits. Color displays (weather radar) are scheduled to go into C-141 and modified JTIDS display and advanced F-15 rear cockpit will have color displays. F-16 advanced cockpit proposals by General Dynamics include a color display alternative. The commercial Boeing 757/767 will be using color CRT ADI's, HSI's and color CRT engine instruments/failure warning displays. Specific objectives for early implementation include 1) establish a standard family of color CRT displays which vary in size to meet fighter to cargo applications (5" X 5", 6" X6", 7" X7", 5.5" X 7", etc); 2) establish standard CRT glass bottle and CRT assembly sizes for color displays with government owned glass molds; and 3) establish an on-shore (CONUS) source for color CRT manufacturing. Currently, the beam penetration phosphor technology lies in France and shadow mask technology lies in Japan for the special size CRT displays used in military avionics. It would be desirable to develop technology within the USAF for color CRTs using high resolution color shadow masks. Currently, beam penetration color CRT production is available in the US using French phosphors.

This strategy supports additional 6.4 funding (64201/XXXX) effective FY84 to initiate a controls and displays program for multiple aircraft applications. The market potential is sufficient to justify an early start as soon as the initial two or more firm aircraft candidates have been programmed as discussed in the Systems Integration strategy. A current estimated funding profile (in millions of dollars) to support this initiative is as follows: FY84 - .5, FY 85 - 2.5, FY 86 -5.0, FY 87-5.0, FY 88-5.0, to completion - 7.0. FY 83 efforts should consist of in-house planning to establish cost/benefits, initial aircraft applications, total market potential and detailed development/production program definition including acquisition strategy.

This controls and displays investment strategy should evolve as discussed above for near/mid term applications; however, it should also become a means to continue engineering development of current laboratory efforts after technology transition in the mid to late 80s. A key segment of the AFWAL Night/ In-Weather major technology thrust is to achieve increased crew/system improvements, reductions in crew workload, fewer demands for routine tasks, additional time available for complex decisions and access to information on demand.

FLIGHT CONTROL

The Flight Control investment strategy is the segment of the total core avionics strategy which deals with traditional electronic flight control systems and emerging "integrated control" concepts. The integrated control concept employs coordination of various system functions associated with flight, inlet, propulsion, weapon and fire control to improve overall weapon systems effectiveness. Integrated control applications which closely relate to traditional avionics functions include: 1) air-to-ground attack - flight, fire and weapons control are coordinated to maximize kill probability at minimum exposure from ground based threats and 2) TF/TA - terrain, enemy threat, and system status are used to establish a flight trajectory which can be followed for improved survivability. Current program elements/projects which support the flight control strategy are shown in Table 2-3.

The thrust of this flight control investment strategy is to support the AFWAL NIW technology thrust with sufficient funding to develop and demonstrate technologies applicable to the next generation fighter. The scope of the NIW thrust applicable to flight control includes modeling, algorithm development, hardware/ software architecture, pilot interface, reliability and fault tolerance, maintenance and logistics interface and system demonstrations and test beds.

The AFWAL F-16 Advanced Fighter Technology Integration (AFTI/F-16) program (PEs 63205/2506 and 63245/2061) provides development and flight validation of a number of flight control technologies which are needed for improved survivability and weapon delivery accuracy. Technology areas being demonstrated include digital flight control, integrated flight/fire control, low altitude radar auto pilot and other automated functions supporting low altitude maneuvering attack and air-to-air combat. This program is providing key flight validated technology alternatives with potential for current fighter aircraft enhancements (e.g. F-16, F-15) as well as future fighter aircraft.

A major area of emphasis/concern in flight control is the design and verification of software. A common software error could be programmed into redundant computers resulting in an undesirable and possibly catastrophic situation. The current trend is toward coupling the flight control system to the fire control system for automatic weapon delivery and to the radar for automatic terrain following. This places greater emphasis on radar and fire control systems for safety because of the large inputs they can put into the flight control system. Even minor changes to software can result in instabilities of the flight control system/aircraft combination. The probable implications of this are airframe contractor life time control/maintenance of flight control software. This may be necessary to enable closed loop system/aircraft simulations to verify stability effects of software changes before flight.

The evolving role of Core Avionics in reducing pilot workload, increasing flight safety and overall mission effectiveness underscores the importance of a strategy to address these critical issues before the next generation aircraft enter full scale development. The AFWAL Night/In Weather (NIW) major technology thrust is the primary effort currently under way to address these issues. The direction of this thrust is in line with and strongly supported by the recommendations of a recent National Research Council study. The following report of this study was taken from the March 29, 1982 Aerospace Daily:

> The Air Force should commit itself now to a high degree of automation for its fighter aircraft of the 1990s, and it should start immediately on a systems-oriented program emphasizing automated flight trajectory and attitude control, according to the National Research Council's Air Force Studies Board.
>
> Reporting on an Air Force funded 1981 summer study, the board said engine and power system control, weapon delivery and fire control, and navigation and communications functions also are "promising candidates for automation." A systems approach is needed, it said, to avoid "piecemeal automation that could be costly and would result in only partial solutions not adaptable to growth."

The board noted that the Air Force has no established position on aircraft automation requirements, and it recommended a "firm decision ... to automate specific critical functions and/or infrequently performed but essential functions that are currently performed manually."

The study group's technology subcommittee said that current attempts to automate flight trajectory and attitude control, threat warning and weapon delivery are "likely to succeed," that cooperative Identification Friend, Foe or Neutral (IFFN) systems "may be feasible," and that technology to automate target identification "remains elusive."
The subcommittee noted that the current F-15 Integrated Fire Flight Control (IFFC) and F-16 Advanced Fighter Technology Integrator/Advanced Maneuvering Attack System (AFTI/F-16 AMAS) programs both address coupling flight and fire control and that the AFTI/F-16's digital flight control and advanced cockpit make it "the likely aircraft" to add automated propulsion control. This kind of expansion "could provide early information to assess automation techniques," it said.

It added, however, that neither program addresses the issue of core architecture for future systems. It recommended that the Air Force "initiate an effort to develop the overall core architecture for flight trajectory and attitude control, establish appropriate standards, and produce a prototype for flight test and evaluation as a total system." It said automatic reconfiguration, fault tolerance throughout the system and state-of-health reporting are "of prime importance" in this.

The subcommittee also called for "a new program on cooperative IFFN and increased emphasis on non-cooperative IFFN research."

The board said that the Air Force should develop a method for allocating functions between automated systems and the pilot, and that it should study how pilots carry out combat tasks. "Automating or partially automating a higher class of appropriate cognitive functions, such as the ability to assess the combat situation, or to plan strategies and escape routes, should be a part of the Air Force's long-range program," it said.

> Integrated automation will change th eway designers must think of aircrat, the board commented. "The classified parochial and dissected view of an aircraft is not likely to survive. In the information sense, it can no longer be looked on as a propulsion system with its controls, thrusting an airframe with its controls, carrying some sensors with their controls, delivering weapons by an avionics system with its controls and displays, all integrated and managed by a crew. The interplay among all systems will be so tight and the exchange of information so intensive that many automated applications, only a system-level view will be appropriate."
>
> The board said senior Air Force managers appreciate automation's potential but are "conservative in making commitments" because of concern about increased cost and complexity. Pilots, with "a strong show me" attitude, want the ability to select automated functions and intervene in their operation, the board reported, but they accept automation of functions "that humans cannot perform adequately, functions that distract pilots from critical tasks, and functions or routines that are infrequently performed and can be done more reliably through automation."

Some postive steps have been taken which will help to implement a strategy for increased automation, as recommend above by the National Research Council's Air Force Studies Board. The NIW major Technology Thrust is one such step. Another step has been the AFWAL/ASD initiative for planning and implementing technology transition. These steps represent a trend toward a systems oriented approach to next generation aircraft as well as earlier coordination across traditional organizational boundaries and functional disciplines.

ELECTROMAGNETIC COMBAT

The Electromagnetic Combat strategy of this AMP addresses Electronic Warfare C^3 Countermeasures adn non-lethal segments of Defense Suppression systems. Lethal segments of systems are considered to be part of the armanment area and therefore, are outside th scope of this AMP. Program element/projects which support the Electromagnetic Combat strategy are shown i Table 2-3. The thrust of the Electromagnetic Combat strategy is to support the Electromagnetic Combat Action Plan (ECAP) objectives and related investment strategies which focus of the Electromagnetic Combat area. Related investment strategies which focus on near/mid term capability improvements are being developed and implemented at WR-ALC (e.g. ALR-69 improvements and otehr Class V Class IV modification); ASD (EW and SEAD development efforts); and ESD (C^3CM planning and related development efforts). ASD also supports the New Threat Warning System (NTWS) program as a partner in the joint 6.3/6.4 development effort with AFWAL. ASD/RW is currently developing a consolidated EW investment strategy which will input to the Vanguard Electronic Combat Submission area plan.

Related investment strategies which focus on mid/far term capability improvements include the AFWAL share of the NTWS program and the "survivability" portions

of the NIW Major Technology Thrust and other technology base efforts. Major technology areas being addressed to improve survivability include system/subsystem hardening, reduced observables (stealth), improved system/subsystem performance and system automation. System automation is concerned with all of the problems of survivability through integrated TF/TA (reduced threat exposure); reduced pilot workload; increased immunity to failure and jamming; enhanced positioning for terrain/threat avoidance; and optimal flight trajectory with EW integration including coordinated EW strategy for avoidance, jamming and evasion. The implications of stealth technology cover the whole spectrum of Electromagnetic Combat. Self protection/ standoff EW effectiveness is improved; smaller EW systems are feasible; low power decoys are more effective; and lethal suppression will be more efficient.

The above trends in technology imply a systems oriented approach to the survivability needs of next generation aircraft. It is critically important that all of these system/subsystem technology areas be supported. A piece meal approach to the problem is no longer acceptable. Because of the overall complexity of the survivability problem, including multiple organizations involved, more streamlined planning and management is required. The ECAP initiative instituted recently can go a long way toward consolidating guidance for detailed planning and implementation by the WR-ALC, ASD, ESD and AFWAL participants.

Generally, the Electromagnetic Combat area lacks sufficient funding. Test facilities require upgrade. Key program elements such as 63718, 63743 and 63750 require additional funding. Additional 6.4 and 3010 funding is needed for timely transition of mature programs. Earlier versions of the ECAP reflected these deficiencies in 6.4 and 3010 funding. This investment strategy will not attempt to quantify all funding deficiencies in the EC area. The approach taken here will be to support the EC related strategies referred to earlier, after they are further refined.

TARGET ACQUISITION

The target acquisition/strike strategy addresses those functions which include navigation in the final phases of a mission profile before target acquisition, target detection/validation, and fire control/weapon delivery. Data links are included under the strategy for communications. Applicable sensors/subsystems include radars, infrared, laser/electro-optical and combined sensors/integrated subsystems such as PAVE TACK and LANTIRN. Program elements/projects supporting this strategy are shown in Figure 2-3. Major avionics programs with near/mid term impact include 11113/ 2601 (B-52 Strategic Radar), 64226 (B-1B), 64201/2519 (RPSP), 27130 and 27133 (F-15 and F-16 RPSP), and 64249 (LANTIRN). Major avionics programs with mid/far term impact are contained primarily within the AFWAL NIW Major Technology Thrust. Needs being addressed within this functional area include improved spectrum coverage, improved ECM/EOCM resistance, improved night/in-weather performance and improved sensor integration/signal processing. Considerable effort is also being conducted on the LANTIRN target recognizer. This strategy supports adequate 6.3, 6.4 and 3010 funding for all of these programs.

RECONNAISSANCE

The reconnaissance investment strategy in this AMP focuses on tactical reconnaissance due to the relatively limited access to strategic programs such as the SR-71 and the limited applicability of some strategic reconnaissance systems to

the aircraft avionics area. Key program elements/projects applicable to the reconnaissance strategy are shown in Table 2-3. This investment strategy supports the current baseline program structure at sufficient funding levels to carry out the planned baseline programs.

5.4 FUNDING PERSPECTIVE

This section will present the current funding profiles along with a discussion of investment strategy considerations applicable to avionics. RDT&E funding profiles were extracted from Five Year Defense Plan (FYDP), Program Objectives Memorandum (POM) and Budget Estimate Submission (BES) figures which were current as of early FY83. Modification funding was extracted from the P3X Report dated 20 September 1982. Table 5-5 shows the programs which have the major impact on each of the budget categories described during the period FY83-88. The scope of this discussion of funding excludes production funding for classified projects and aircraft related funds which are not included in the aircraft line. Examples of these funds are pod production programs (e.g., LANTIRN, PAVE TACK, ALQ-131) and PLSS Air Relay Vehicle production. This discussion does address 3600 and 3010 (P1100) funding pertinent to avionics development, support equipment development (e.g., 64247, MATE), aircraft integration, and aircraft modifications.

Avionics RDT&E funding as shown in the September 1982 BES has increased significantly over the earlier POM and FYDP budgets. Figure 5-2 reflects this change. Figures 5-3 through 5-5 show FYDP, POM and BES RDT&E funding breakouts by 6.2 (Exploratory Development), 6.3 (Advanced Development), and 6.4 (Engineering Development), respectively. The BES figures for 6.3 and 6.4 programs have increased over earlier budgets, however, 6.2 program funding in the POM and BES is reduced. It should be noted that the major budget differencies are shown over the FY84-88 period. Current year budgets (FY83) are relatively unchanged or slightly decreased from earlier projections. This is normal during the current budget year. The bow wave in Figure 5-5 is also a normal characteristic of 6.4 budgets during the period immediately following the current year.

Figures 5-6 through 5-9 provide an avionics functional area breakout of BES RDT&E funding. The proportions of funding being allocated to each functional area are roughly equivalent to those shown in earlier budgets. These figures and Table 5-5 show that the avionics program make-up has changed little over the past year. The variations occurred primarily in schedules and funding levels within existing P.E.s/projects.

Figures 5-10 through 5-13 show class V and class IV modification funding by aircraft and functional areas, respectively. Class V modifiction funding (as shown in figures 5-10 and 5-12) increased significantly during the period FY87-88. This increase was due to added funding for MILSTAR, GPS, SEEK TALK and F-15 MSIP. The overall budget throughout the FY83-88 period remained essentially the same, however, because of significant reductions during the period FY84-85. The changes in the overall class V modification funding profile resulted from a combination of program changes, such as those described, and variations in program schedules. The most significant change in class IV modification funding (figures 5-11 and 5-13) from earlier budgets resulted from added funding for the F-111 Avionics Modernization Program over the FY86-88 period.

TABLE 5-5 MAJOR PROGRAM CONTRIBUTORS TO AVIONICS BUDGET (FY 83-88)

FUNCT AREA	6.2	6.3	6.4	CL IV	CL V
COM	Data TXMSN & Receipt	ICNIA LPI Com Tech Terminal Seg Tech	MILSTAR AFSATCOM AJ Comm JTIDS E-4 E-3A	ARC-190/HF	KY 58 Hard, AJ Comm E-3A ENH F-15 JTIDS EC-135 MILSTAR
NAV	Inertial Tech	ICNIA Adv Nav Tech	GPS	F-4 INS CARA F-4G INS F-111	B-52 OAS A-10 ASN 141 F-111 INS GPS C-130SCNS,
ID		ICNIA Coop ID Tech	CIS NC ID		F-15 F-16
SI	Sys Design Tech	Pave Pillar Common Language VHSIC Computer Tech	F-16, IDA, MATE B-1B B-52 OAS F-15 HH-60D	SCADC F-111	B-52 OAS F-16 MSIP
CD			B-1B	FDR	B-52 OAS
FL		Control of Flt Fighter Attack Tech	B-1B	FSAS B-52 AFC	
EC	Passive ECM Active ECM	NTWS C^3CM EOCM EW Tech EO Warfare	EF-111A, B-52 Prot Sys, Compass Call, Active CM, ASPJ, F-15 Prot Sys, PLSS, F-4G WW, Threat Sys, Monopulse	ALR-46	F-4E ALR74 B-52 F-4G WW Perf Update F-16 MSIP EF-111A A-10 ALR-69 F-15 MSIP F-4E to G

TABLE 5-5 (CONT.) MAJOR PROGRAM CONTRIBUTORS TO AVIONICS BUDGET (FY 83-88)

FUNCT AREA	6.2	6.3	6.4	CL IV	CL V
TA/S	Fire Control Laser & EO All WX Strike	Pave Mover Advanced Radar Fire Control	B-1B LANTIRN B-52 OAS PSP B1B	F-111 B-52 ASG-15 B=52 Radar F-4E APQ-120 ANT F-4D APQ-100R/T A-7 DSC	F-16 MSIP F-15 PSP F-15 MSIP
RE	Recon & Targ Surv Tech	ATARS	AAQ-X 1R SLAR		

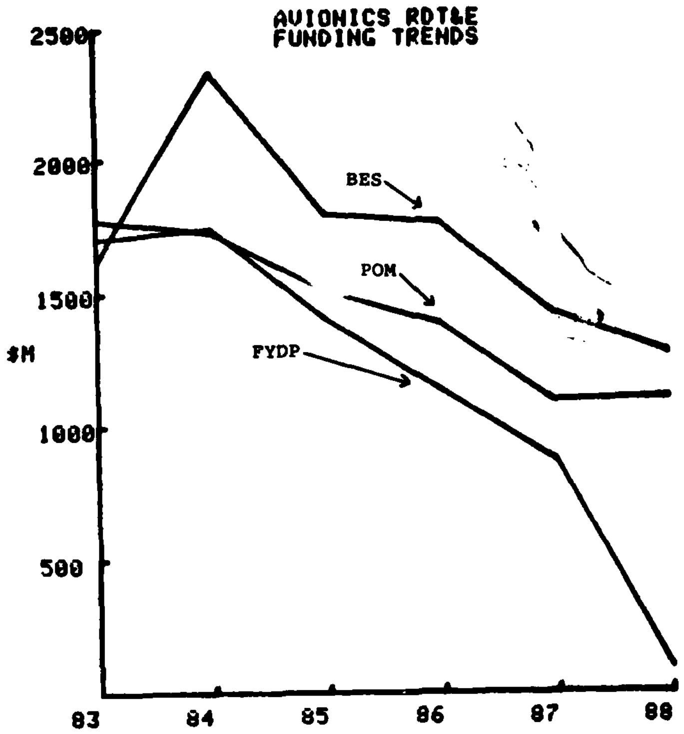

FIGURE 5-2

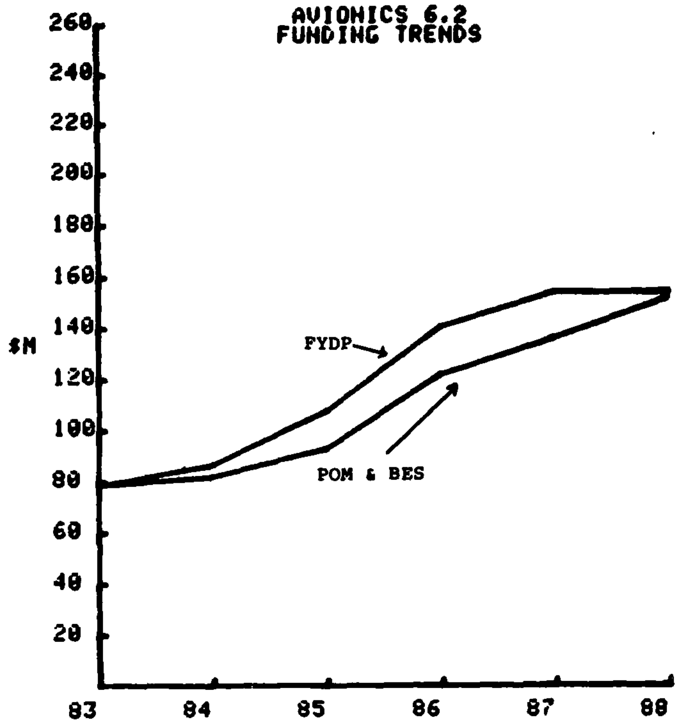

FIGURE 5-3

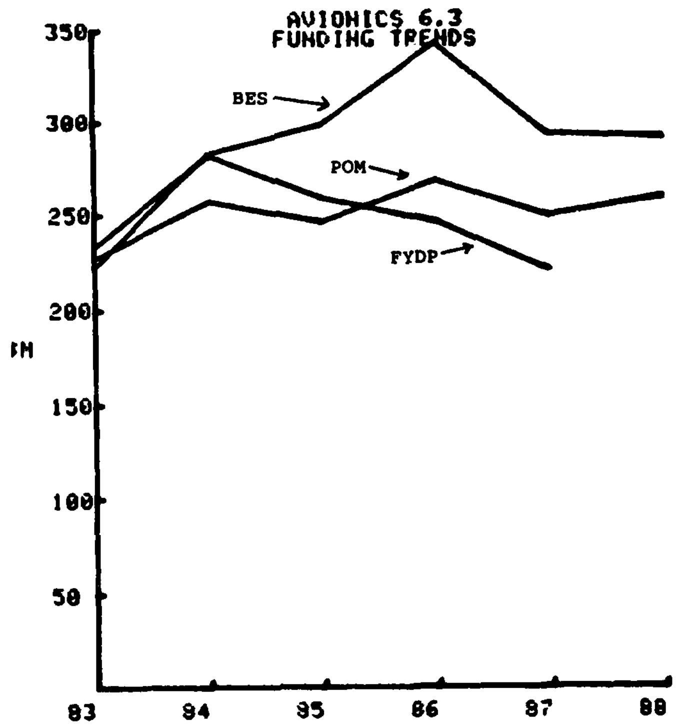

FIGURE 5-4

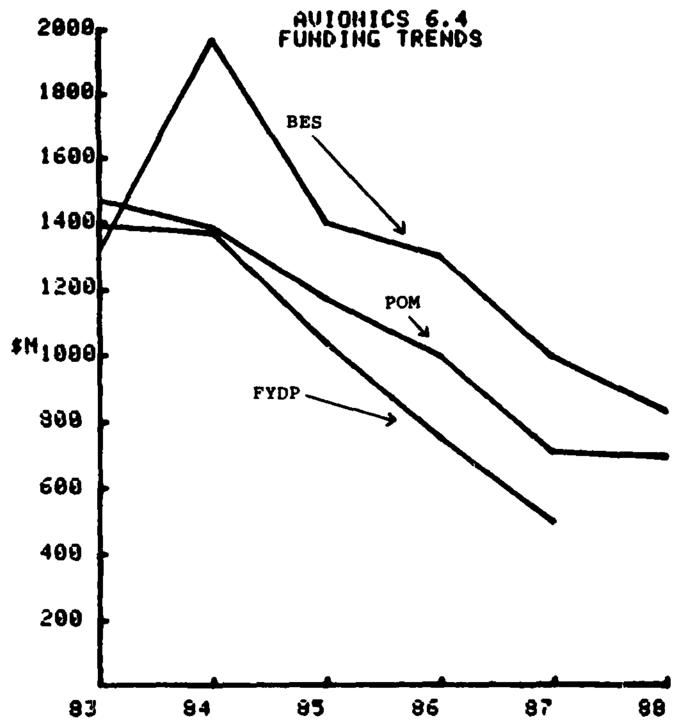

FIGURE 5-5

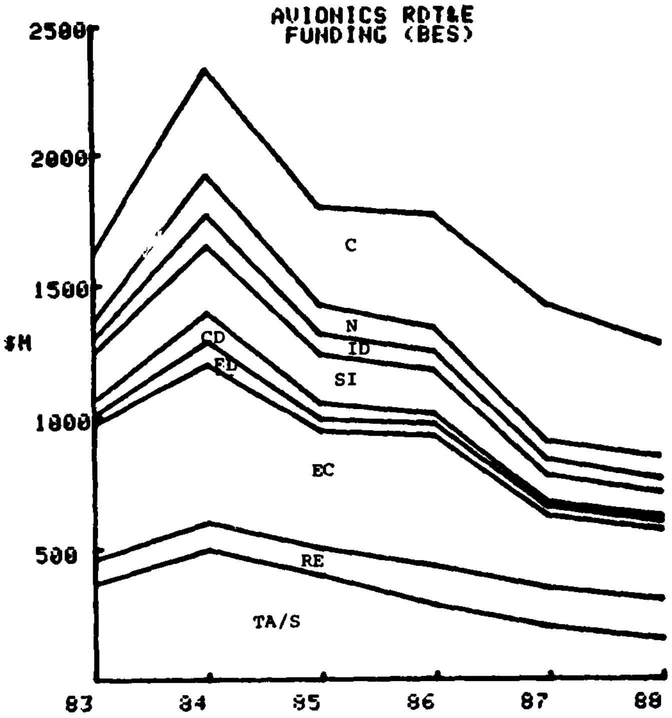

FIGURE 5-6

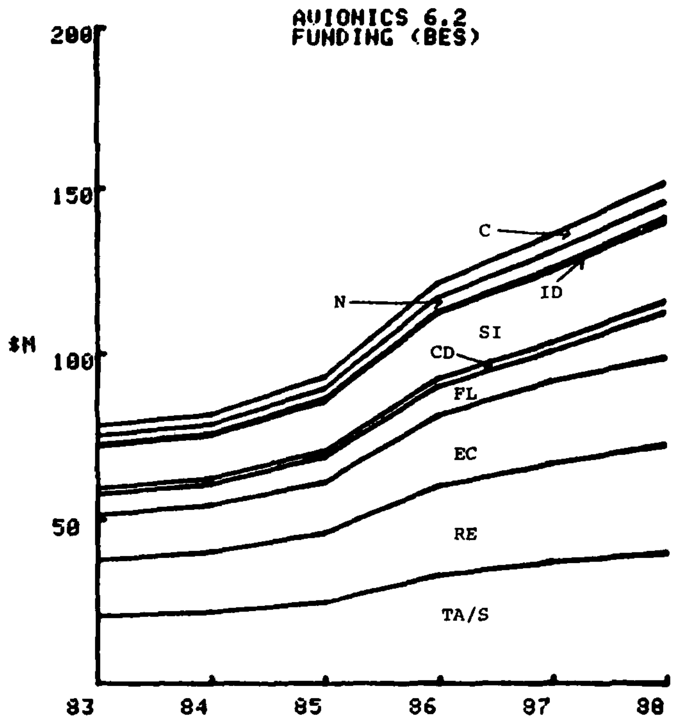

FIGURE 5-7

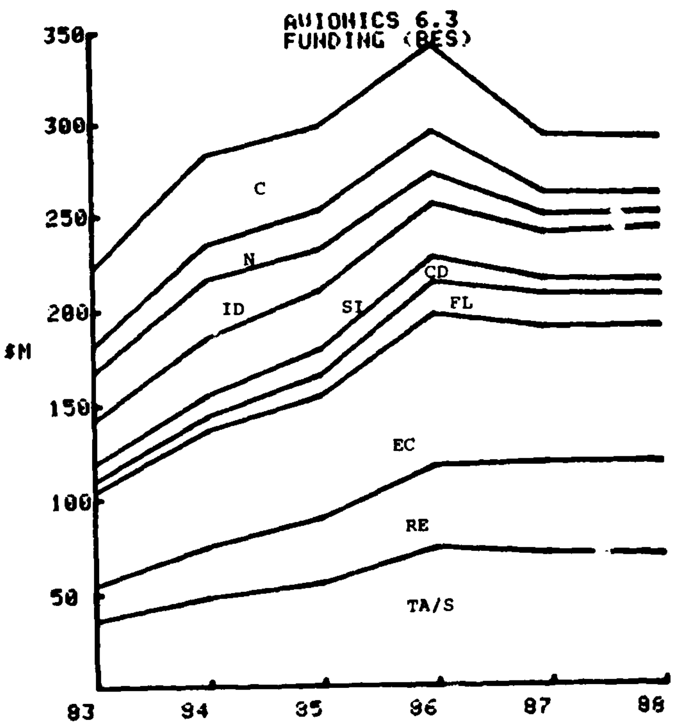

FIGURE 5-8

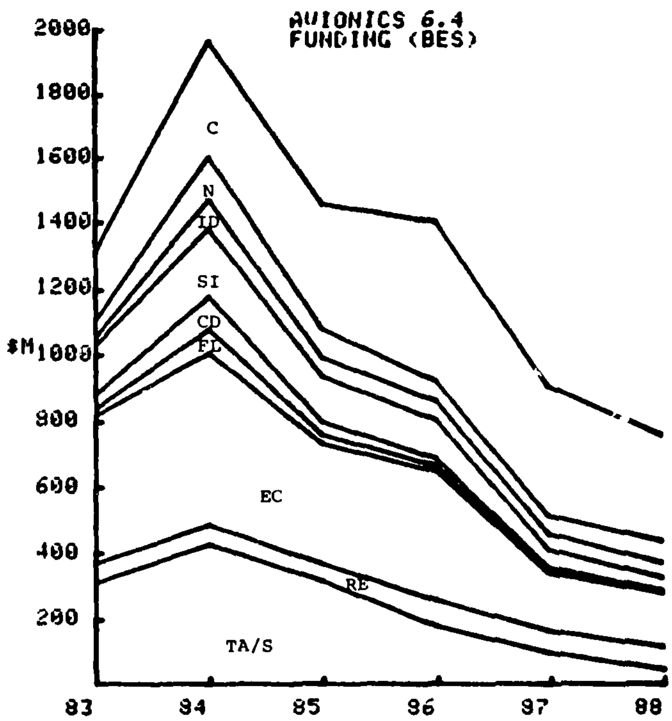

FIGURE 5-9

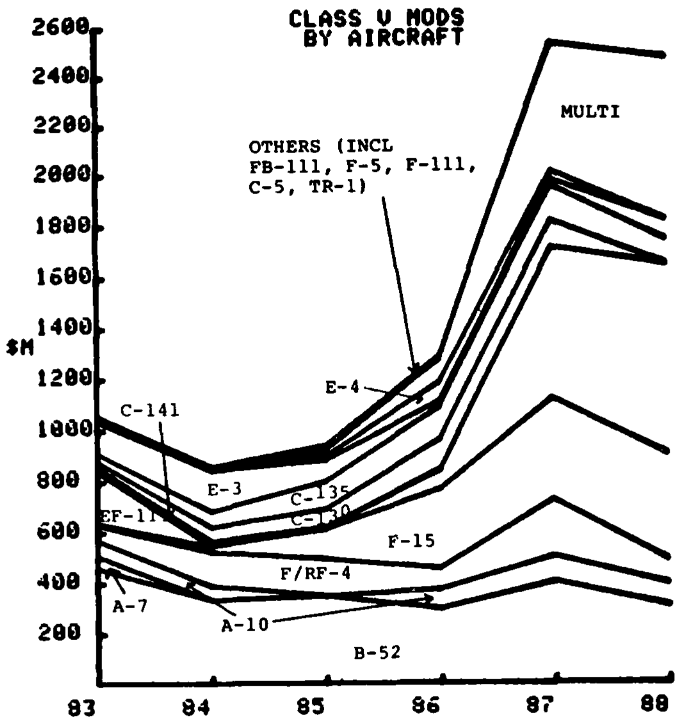

FIGURE 5-10

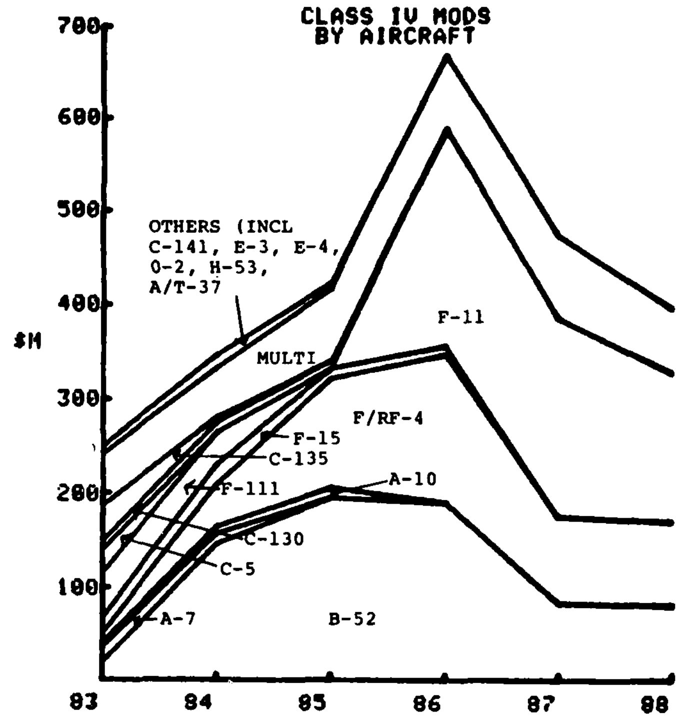

FIGURE 5-11

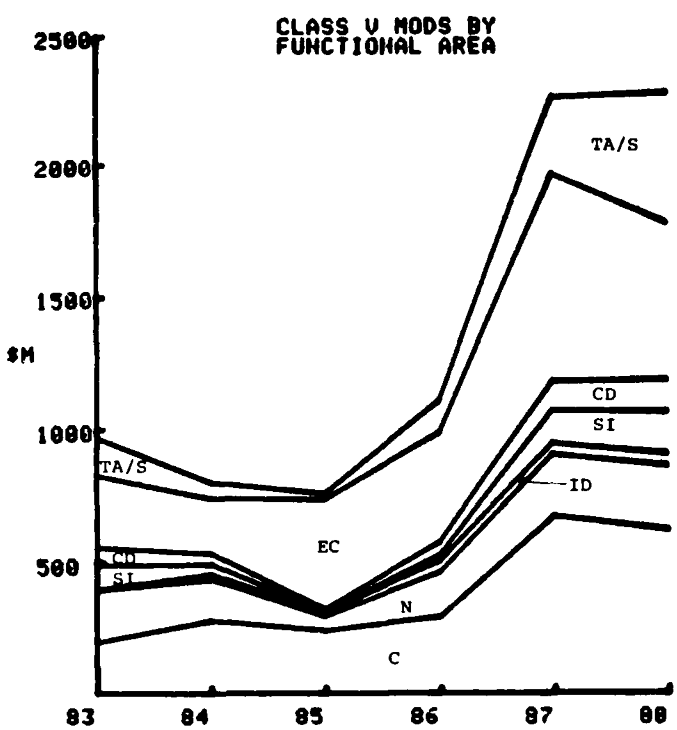

FIGURE 5-12

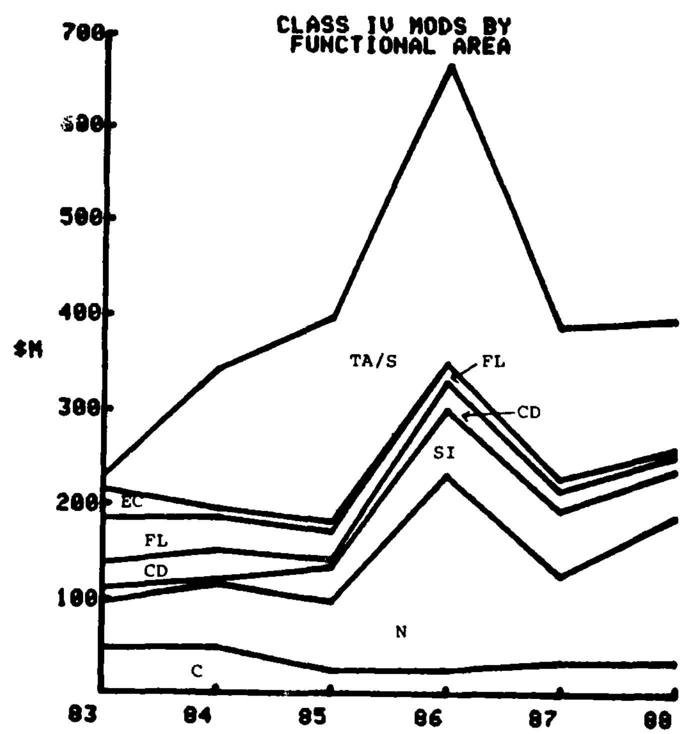

FIGURE 5-13

There are several related investment strategies which overlap or fall within the avionics area. These strategies include the areas of C^3I, EW, C^3CM, the AFWAL Night/In-Weather major technology thrust, and other key technology program initiatives . Investment strategies in these areas are evolving and will become more precisely defined as time goes on. Of equal importance are strategies embodied in master modification plans such as the F-16 MSIP. These modification planning initiatives will provide an important focus for investments across the 6.4 and modification funding lines. The major technology thrusts being developed within the laboratory communities and the functional area plans (e.g., C^3I, EW, etc.) will provide direction for 6.3 and 6.4 avionics investments. Investments for 6.2 avionics programs should be broad based in nature and not necessarily targeted for specific avionics requirements. Typically, 6.2 avionics programs provide the technology base to support many requirements. Several observations can be made concerning the current avionics budget. They are:

a. Return on Investment (ROI) has become a major factor during the recent period of high interest rates. The traditional practice of stretching programs because of a limited budget may no longer be an acceptable alternative on some programs since companies cannot operate this way during periods of high interest rates. The long term effects high interest rates could be a further erosion of the industrial base. The implications of this may be more robust funding for fewer programs, especially in the 6.4 and 3010 cateogories, unless interest rates decline to lower levels.

b. Flight test costs have gone up significantly impacting both on-going and planned flight test programs. This problem, coupled with continued limitations on funding for facilities, could have a severe impact on avionics programs throughout the 1980s. Adequate funding for the Integration Facility for Avionics System Test (IFAST) and other facilities which reduce flight test cost on many programs is essential to alleviate this problem. Costly program stretches and/or inadequate testing before production decisions will result if facilities do not keep pace with planned prorgams.

c. The current trend in acquisition guidance is toward evolutionary capability improvements (e.g., P^3I) as opposed to revolutionary strategies. Closely related policy guidelines call for early investments to achieve economies and to improve reliability in the long run. These trends have a significant impact on 6.4 funding as well as modification funding. The exception to this trend lies in the evolving 6.2 and 6.3 strategies which tend to be revolutionary. However, many 6.3 programs are planned for technology transition and insertion into current systems/subsytems as evolutionary improvements.

d. Modifications are the most certain approach for achieving early benefits from an evolutionary strategy. New aircraft programs such as B-1B and F-15/16 derivatives also support this evolutionary concept. However, the earliest capability from these programs will be provided primarily in the midterm period. Substantial additional modification funding in the near/mid-term may be essential if the F-15/16 derivative programs experience delay or lack of funding support. Additional modification funding would be desirable, in any case, because of substantial leverage provided by these investments. A continued tight modification budget will also reduce the opportunities afforded by current 6.4 avionics investments. JTIDS, GPS, jam-resistant communications radar improvements, and EW improvements are examples of 6.4 programs which require substantial modification funding, if the full potential is to be realized.

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DEPARTMENT OF THE AIR FORCE WASHINGTON DC DEC 82

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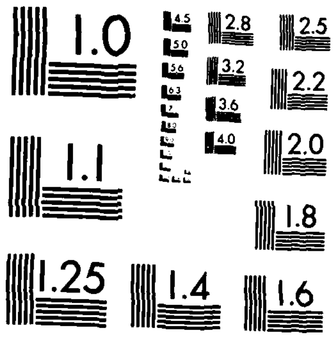

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

e. Programs falling within the 6.4 category provide the maximum leverage from RDT&E funding for near/mid-term capability. Timely, adequate production funding is required to realize this benefit. Timely technology transition from advanced development (6.3) also requires that 6.4 funding be preplanned and in place when the technology has matured. Historically, these 6.4 programs have been highly structured and resistant to major changes because of the relatively high funding level, a fixed price contract environment, and advocacy throughout the system. For these reasons, the impact on 6.4 programs as a result of planning is frequency minimal. The most effective positive influence for changes in 6.4 funding may result from modification planning initiatives of the F-16 MSIP or F-4 variety. These types of plans and planning activities can go a long way toward assuring the ultimate effectiveness of 6.4 programs, including compatibility with the aircraft. Current planning initiatives in the C^3I, EW and C^3CM areas should have a favorable impact on the effectiveness of 6.4 programs; however, a sustained, concerted effort will be required to measurably improve many established 6.4 programs.

f. Funding for 6.3 programs provides the maximum leverage for far term capability and supports revolutionary strategies required for next generation aircraft (ATF/ATB). The potential exists to achieve maximum leverage from 6.3 funding based on planning initiatives such as the NIW Major Technology Thrust and coordination across traditional organizational boundaries (technology transition planning). Flexibility exists within the 6.3 line to demonstrate new system/subsystem concepts and to change directions as appropriate. Planned technology availability dates of many of the current 6.3 programs fall within the FY 86-88 period. The key role of 6.3 funding is best illustrated by listing some current 6.3 programs: VHSIC, NIWS, LANTIRN Target Recognizer, and PAVE PILLAR. The importance of adequate 6.3 funding cannot be overstated. Funding for 6.3 programs has previously been characterized by uncertainty. This trend must be changed through increased emphasis and a more widespread Air Force commitment to achieving these capabilities within the planned technology availability dates. A greater commitment and a clear direction for 6.3 programs will provide the added benefit of increased effectiveness from industry IR&D investments.

g. The current 6.2 funding levels are still not in line with earlier OSD guidance calling for a five percent annual real growth. The funding levels have been most adversely affected during the FY 82-85 period. Acceptable levels of growth are budgeted for FY 85 and 86; however, a real annual growth of seven to ten percent should be established early and maintained over an extended period of time.

ANNEX A

AVIONICS PROGRAMS AND REFERENCES

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
A-10 Squadrons	27131	223	TA/S	A-10		AF/RDPN; ASD/TAX; TAC/DRFG
AAD-5 Improved Infrared System	(2871)	227 327	TA/S	RF-4C	TAC-3-71	
AAQ-X Infrared Sensors	64710/ 2660	327	RE		TAF 313-74	AF/RDPE; ASD/RWT; TAC/DRFR
Active Counter-measures Systems	64739/ 2272	371	EC	A-10A F-16A F-16B	TAF 9-68 TAF 304-80 TAF 312-80 MAC 07-81 MAC 08-81 MAC 09-81	AF/RDPE; ASD/RWW; TAC/DRWP
Active Electronic Countermeasures	62204/ 2000	521	EC		TAF 301-78 TAF 304-80	AFSC/DLWA AFWAL/AAWW TAC/DRWP
Adaptive High Frequency/Very High Frequency (HF/VHF) Communications	33131/ 2833	333	C		MAC 3-77 SAC 5-77	AF/RDSS; ESD/YSL; SAC/XPFC; MAC/XPQS
Advanced Airborne Radar Development	63103	327 227 551	TA/S		TAF 307-81 TAF 315-75 TAF 320-79 TAF 304-78	AF/RDPV; AFWAL/AARM; TAC/DRAV

* Phone numbers provided in a condensed list beginning on Page A-27.

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Advanced Devices	63203/ 69CK	551	EC			AF/RDPV; AFWAL/AADM
Advanced Electro-Optical Counter-Measures (EOCM)	63743/ 2222	TB 371 374 224 551	EC		SAC 4-76 TAF 312-80 TAF 20-68	AF/RDPE AFWAL/AAWD; TAC/DRWX; SAC/XPHN
Advanced Fighter Technology Integration (AFTI)	63245/ 2061	TB	FL			AFSC/DLFF AFWAL/FII
Advanced High Frequency (HF) Technology	63727/ 2748	333 345	C		MAC 3-77 MAC 3-81 SAC 8-79 SAC 5-77	AF/RDPV; SAC/XPFR; MAC/XPQS
Advanced Recon-naissance/Strike Radar	63203/ 2733	221 223 371 551	TA/S		TAC 9-68 TAF 302-81 TAF 303-76	AF/RDPV; AFWAL/AARM; TAC/DRAV
Advanced Reconnaissance Sensor (ADRES)	64710/ 2337	345 327	RE		TAF 315-75 MENS	AF/RDPE; ASD/RWT; TAC/DRFR
Advance Reference Systems Technology	63203/ 666A	551 361	N			AF/RDPV AFWAL/AAAN
Advanced System Avionics (ASA)	63253/ 2734	223 551	SI		TAF 307-81	AF/RDPV; AFWAL/AAAS
Advanced Tactical Air Reconnaissance System	63239	227 327	RE		MENS TAF 320-79	AF/RDQT; ASD/RWT; TAC/DRFR
Advanced Tactical Fighter (ATF)	63230/ 2472	221	TA/S		MENS	AF/RDQT
Advanced Vertical Lift Development (JVX)	64235	218			USAF 14-82	AF/RDQL

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Advanced Weapons Delivery	63203/ 69DF	223 551	TA/S		TAC 9-68 TAF 302-81 TAF 303-76	AF/RDPV; AFWAL/AART; TAC/DRAV
Air Force Satellite Communications (AFSATCOM)	33601 (2784)	333 334 345	C	B-52G B-52H FB-111A	JMENS 5-79 MAC 3-77 MAC 3-81	AF/RDSS; SD/YKA; ESD/DCK; SAC/DCXF
Air Force World Wide Military Command and Control System (AFWWMCCS) Intersystems Planning and Engineering	63735/ 2188	333 334 345 331	C		JMENS MAC 3-81	AF/RDSS
Airborne Computer Specification and Software Standard-ization	64201/ 2297	223	SI			AF/RDPV AFSC/SDB ASD/AXS
Airborne Radar Electronic Counter-Counter-measures (ECCM)	63750/ 2334	221 223 551	TA/S		TAF 310-73	AF/RDQA AFWAL/AARM TAC/DRCC
Airborne Self-Protection Jammer (ASPJ) Common Development	64737/ 2712	221 223 371	EC		TAF 303-76 TAF 304-80	AF/RDPE ASD/RWW TAC/DRWP
Airborne Video Tape Recorder (AVTR)	(2916A) (2917A)	221 430	TA/S	F-4D F-4E RF-4C	TAF 322-75 TAF 312-77	ASD/RWT OO-ALC/MMSPM WR-ALC/MMIMF TAC/DRAV
Aircraft Monitor and Control	(3087)			B-52G B-52H		OO-ALC/MMHH
Aircraft Naviga-tion System Verification	65708	361	N			AF/RDPV

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Air Launched Cruise Missile (ALCM)	(3022)	113		B-52G	SAC 12-76	ASD/YYA OC-ALC/MMHH SAC/XPHN
AJN-16 Mark II Compass INS	(36068C)		N	F-111D FB-111A		SM-ALC
ALE-40 Chaff Dispenser System	(2900) (2981) (3004)	228 261 371	EC	F-4D F-4E A-7D C-130H C-130E HH-3E	MAC 7-81	OO-ALC/MMSPM ASD/RWW OC-ALC/MMSF WR-ALC/MMSF MAC/XPQS
All-Weather Reconnaissance Strike Avionics	62204/ 7622	TB 521	TA/S			AFSC/DLWA AFWAL/AARM
All Weather Target Classification Sensor	64710/ 2749	327	RE		TAF 315-75	AF/RDPE
ALQ-119 Radar Warning Receiver	(2930)		EW	F-111 AC-130		SM-ALC/MMKREM SM-ALC/MMKREF
ALQ-125 TEREC	(2707)		RE	RF-4C		
ALQ-131 Comprehensive Power Management System (CPMS) Development/Integration	64737/ 2715	371	EC		TAF 304-80	AF/RDPE ASD/RWW TAC/DRWP
ALQ-137 ECM Receiver	(2960)	113 371	EC	FB-111		SAC/XPHN
ALQ-153 Tail Warning System	(2923)	113	EC	B-52	SAC 23-69	OC-ALC/MMHHA WR-ALC/MMRMS SAC/XPHN
ALQ-155 ECM Power Management	(2973)		EC	B-52G B-52H	SAC 3-74	OC-ALC/MMHHM WR-ALC/MMRMS SAC/XPHN

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
ALR-56 Radar Warning Receiver Update	(3010)	221	EC	F-15	TAC 9-68	WR-ALC/MMA-1 ASD/TAF
ALR-62 Radar Receiver	(2957)		EC	FB-111 F-111		SM-ALC/MMKREM SM-ALC/MMSREF ASD/RWW SAC/XPHN
ALR-69 Compass Tie-Radar Warning Receiver	(10349C) (2952)		EC	A-10A F-4D F-4E	TAC 31-68	WR-ALC/MMRMT OO-ALC/MMSRH OO-ALC/MMSR
ALR-74 Radar Warning Receiver	(3088)		EC	F-4E		SAC/XPHN
ALT-28 ECM Transmitter Update and Cooler	(2970)		EC	B-52G B-52H	SAC 8-75	OC-ALC/MMHHM WR-ALC/MMRMS SAC/XPHN
Improvement						SAC/XPHN
ALT-32 Solid State			EC	B-52G B-52H		
AMAC	(3089) (3084)			FB-111A F-111F	SAC 21-72	SAC/XPQO
Amplifier Replacement	48846B			A-7D A-7K		
Antenna Test Range	64738/ 2114	113 371 221 223	EC		SAC 3-79 TAC 9-68 TAC 303-76 TAF 304-80	AF/RDPE ASD/RWW SAC/XPHN
APN-59E Solid State Radar	60067B			C-130 AC-130 RC-135		WR-ALC/MMIMD MAC/XPQS
APY-1 Radar	11603B	340	RE	E-3A		

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPPERATIONAL NEED	POINT OF CONTACT*
APN-218 Doppler Radar	(16405B)		N	C-135		MAC/XPQS OC-ALC/MMIMC WR-ALC/MMIMD
APN-221 Doppler (Replacing APN-17[illegible])	(11622B)		N	HH-3 CH-3 HH-53		
APQ-99 Update	12504B	227 327	TA/S	RF-4C		
APQ 120 Altitude Line	(16509B)		TA/S	F-4E		OO-ALC/MMIPM OO-ALC/MMSR
APQ-130 Redesign EPU	(18317C)		TA/S	F-111D		SM-ALC/MMKREF SM-ALC/MMIR
APS-13[illegible] Weather Radar	(16622B)		N	C-141B C/NC-141A		WR-ALC/MMSPBM MAC/XPQS WR-ALC/MMSH
APS-13[illegible] Weather Radar	(19201B)		N	C-5A		SA-ALC/MMSG MAC/XPQS
ARC-96-100 KW Transmitter and 616A Modem	(3050) (2907)	333	C	EC-135	SAC 7-71	WR-ALC/MMIF OC-ALC/MMIMAC
ARC-17[illegible] AFSATCOM	(2784)	333 345 334	C	EC-135 FB-111 B-52	MAC 3-81	WR-ALC/MMIMC SAC/XPHN
ARC-186 VHF AM-FM Radio	(3042) (3125)	228 345 364	C	A-7D C-130 C-141B C-5A C-7A C-141A EC-135 HH-3E HH-53 KC-135 OV-10A T-39A UH-1	MAC 4-76	WR-ALC/MMIMC MAC/XPQS OC-ALC/MMIMC WR-ALC/MMSH

AVIONICS PROGRAM AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
ARC 186 SWAP Out	(17612C)	228 345 364	C	OA-37B HC-130 C-130 EC-130 WC 135B C 135 EC 135 NKC-135 RC-135	MAC 4-76	WR-ALC/MMIMC MAC/LGMA SAC/XPHV
ARC 190 HF Radio	(16620C)	333 345	C	B-52-GH C-141 C-5A EC-135 F-111-DEF FB-111 KC-135 NKC-135 RC-135	MAC 3-77	WR-ALC/MMIMC OC-ALC/MMHHM OC-ALC/MMHRMA OC-ALC/MMIC MAC/XPQS SM-ALC/MMKREF SAC/XPHN
ARN-101 Pave Tack	(2917)	227 327 223	N	F-4E RF-4C	TAC 12-72	OO-ALC/MMSR OO-ALC/MMSPM TAC/DRAV
ARN-118 TACAN Replacement	(68025C)		R	C-5A		WR-ALC/MMIMD SA-ALC/MMSG MAC/LGMA
ARN-127 VOR/ ILS	(2848)		N	F-4 OA-37B	USAF 10-72	OO-ALC/MMSPM WR-ALC/MMIMC
ARV-30 Atitude Indicator Warning	(16419B)		CD	B-52G B-52H		OC-ALC/MMHRMA
ASN-141 INS	(3048)		N	A-10A	USAF 7-76	ASD/AEA TAC/DRFG
ASG-15 Update	(61050B)		TA/S	B-52G		SAC/XPHN
ASG-21 Modernization	(19611B)		TA/S	B-52H		OC-ALC/MMHRMA WR-ALC/MMIRBB SAC/XPHN
ASQ-151	(42005B)	113	TA/S	B-52G B-52H		

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AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Assurance Techniques for Electronics	62702/ 2338	TB 521	TA/S			AFSC/DLAE
Attitude Indicator	20146B	223	CD	OV-10A		
Automated Data Processing	(3060)			E-4A E-4B		
Automatic Flight Control	18420B	113	FL	B-52G B-52H		
Avionics Data Transmission & Reception	62204/ 7662	TB 521	RE			AFSC/DLWA AFWAL/AAAI
Avionics Systems Design Technology	62204/ 2003	TB 521	SI			AFSC/DLWA AFWAL/AAA
AVQ-26 PAVE TACK	(2974)	223		F-4E RF-4C	TAF 23-72	OO-ALC/MMSRH TAC/DRAV
	(3013)	223	TA/S	F-111F	TAF 332-72	SM-ALC/MMKREM
AVQ-30 Replacement	(61065B)	340		E-3A		
B-1B	64226	113	TA/S		SAC 3-66	AF/RDQ-B1 AFSC/SDB ASD/B1 SAC/XPHD
B52 Autopilot Upgrade	11113/ 2692	113	FL		SAC 6-75	AF/RDQB AFSC/SDB SAC/XPHN ASD/YYH
B-52 Environmental Control System	11113/ L-42139	113	FL	B-52	SAC 6-75	SAC/XPHV
B-52 Fuel Quantity Indicating System	11113/ L-42088	113	FL	B-52	SAC 6-75	SAC/XPHV

ANNEX A(CONT)

AVIONICS PROGRAMS AND REFERENCE

PROGAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
B-52 Offensive Avionics System (OAS)	11113/ 2406	113	CD	B-52	SAC 6-75	AF/RDQB AFSC/SDB SAC/XPHN ASD/YYH
B-52 Strategic Protective Systems	64738/ 5615	113 371 374	EC		SAC 3-74 SAC 6-80	AF/RDPE AFSC/SDWE ASD/RWW SAC/XPHN
CADC	(29133B)			C-5A		SA-ALC/MMSG MAC/LGMA
Combat Helicopter Modernization, Basic Program	64753/ 2843	225	SI	UH-60A	MAC 4-77 TAF 313-79 MENS	AF/RDQL ASD/AFZ MAC/XPQA TAC/DRPS
Command Control & Communication Countermeasures (C^3 CM) Advanced Development	63749	TB 372	EC			AF/RDPE
C^3 CM Technology	63718/ 2754	372 374	EC		TAF 301-78 ESC 3-80 ESC 3-81 SAC 23-69	AF/RDPE TAC/DRWS
C^3 CM Development	64724/ 2677	372	EC		TAF 301-78 ESC 3-80 ESC 3-81	AF/RDPE AFSC/SDWE ASD/RWWW TAC/DRWS
Cockpit Voice Recorder	19607A		CD	C-130		
Communications and Control Technology	62702/ 4519	TB 521	C			AFSC/DLAE
Chaff Dispenser	2900	221	EC	F-4D F-4E		

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Communications Vulnerability Analysis	63727/ 2747	221 430 345	C		TAF 321-75	AF/RDPV
Compass Call Development	64724/ 2462	372	EC		TAF 301-78 ESC 3-80 ESC 3-81	AF/RDPE AFSC/SDWE ASD/RWWW TAC/DRWS
Computer Architecture Applications	63728/ 2529	TB 551	SI			AFSC/DLAE ESD/TOIT
Computer Architecture Standards	64740 2652	352	SI			AF/RDPV AFSC/DLAE AFSC/RADC ESD/TOIT
Computer Security Technology (COMPSEC)	64740/ 2239	C^3	C		MAC 3-81 AFLC 1-80	AF/RDPV ESD/TOIT
Computer Technology For Systems Design & Maintenance	63106 2940	553	SI			AFSC/DLS
COMSEC	33401	345 364	C		ESC 1-77	AF/RDST
Concept Development	63248	DW 440				AFSC/XR
Control of Flight	63205/ 2506	TB 553	FL			AFSC/DLFF AFWAL/FIGF

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Cooperative Identification Systems	64725/ 2598	344 221 223	ID		TAF 304-79	AF/RDPV AFSC/SDTA ASD/AEI TAC/DRAA
Cooperative Identification Technology	63742/ 2599	344 221 223	ID		TAF 304-79 JMENS	AF/RDPV AFSC/DLWA AFWAL/AARI TAC/DRAA
CTVS Cockpit Voice Recorder	(3035)	430	TA/S	F-15	TAF 312-77	WR-ALC/MMA-1 WR-ALC/MMSBB MAC/XPQS
CTVS Cockpit Television Sensor Air-borne Video Tape Recorder (AVTR)	(3035)	430 221 223	TA/S	F-15	TAF 312-77 TAF 322-75	WR-ALC/MMA-1 WR-ALC/MMIMF ASD/RWT TAC/DRAA
Combined Air-borne Radar Altimeter	(10611C)		N	A-10 A-7 C-130 C-5 C-141 CH-3 CH-53 F-111 F-4 T-43 C-135		WR-ALC/MMIMD MAC/LGMA SM-ALC/MMKREF TAC/DRAV
Communication Navigation Update, ADF-60, AIC-18, ARC-186, FCS-80, FD-85, VOR-ILS, WXR-300.	(68098)	N C FL		C-140A		WR-ALC/MMSL MAC/LGMA
Defense Fire Control Modernization	(12613B)	113	TA/S	B-52G		
Digital BNS/INS	(18411B)			B-52G B-52H		SAC/XPHN
Digital Scan Converter	(11602B) (18501B)	223	TA/S	A-7D F-4D		

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Dispensers and Expendables	64739/ 2274	221 371 374 551 224	EC		TAC 9-68 TAF 304-80 TAF 312-80 MAC 07-81 MAC 08-81 MAC 09-81	AF/RDPE AFSC/SDWP ASD/RWW TAC/DRWP TAC/DRWX
Distributed System Tech- nology	63728/ 2530	TB 551	SI			AFSC/DLAE AFSC/RADC
Diversity Reception Equipment	(3067)	331 333	C	EC-135		
DOD Common Language (Ada)	63226	DW 551	Sl			AF/RDST AF/RDPV
DSCG Digital Scan Control Group	(11602B) (18501B)		TA/S	A-7D F4-D		OC-ALC/MMSF OO-ALC/MMSR OO-ALC/MMSPM
E-3A Block 20/25 Improvement	(3128)	340	C RE	E-3A		
E-4A to B Mod	(3044)	331 333 334	C	E-4A	SAC QOR-66	OC-ALC/MMZA
E-4 Block 1	32015/ 2211	331 333	C	E-4	SAC QOR-66	AF/RDSS AFSC/SDEC ESD/YS
E-4 Block II	32015/ 2212	331 333 334	C	E-4	SAC QOR-66	AF/RDSS AFSC/SDEC ESD/YS
EC-135 100 KW Transmitter	(3050)	331 333	C	EC-135	SAC 7-71	
ECM Power Management ALQ-155	(2973)		EC	B-52G B-52H	SAC 3-74	OC-ALC/MMHHM WR-ALC/MMRMS SAC/XPHN

ANNEX A(CONT)

AVIONICS PROGRAMS AND REFERFNCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
EF-111A Capabilities Update	64220/ 2066	372	EC	EF-111A	TAF 315-73	AF/RDPE AFSC/SDWS TAC/DRWS
EF-111A Mod Update	39043B	372	EC	F-111A		
EF-111A Operational Flight Trainer	64220/ 2687	372	EC	EF-111A	TAF 315-73	AF/RDPT AFSC/SDWE TAC/DRWS
Electromagnetic Combat Support	64724/ 2726	430 454 372	EC		TAF 301-78 ESC 3-80 ESC 3-81	AF/RDPE AFSC/SDWE TAC/DRPS
Electromagnetic Compatibility Analysis Center (ECAC)	(33144)	C^3 360				AF/RDPT
Electromagnetic Radiator Devices and Components	62702/ 4600	TB 521	TA/S			AFSC/DLAE
Electro-Optical Collection/ Reconnaissance	64710/ 1155	327	RE		ESC 2-81	AF/RDPE
Electro-Optical Technology	62204/ 2001	TB 521	TA/S			AFSC/DLWA AFWAL/AADO
Electro-Optical Warfare Technology	63743/ 431G	113 371 551	EC		SAC 4-76 TAF 312-80 304-80 20-68	AF/RDPE AFSC/DLWA AFWAL/AAWD TAC/DRWX SAC/XPHN
Electronic Warfare Data Base	35887	430 454 374	EW		TAF 305-76	AF/INW TAC/DRPS
Electronic Warfare Repro-gramming Update	64739/ 2879	113 374 371	DS		SAC 6-80 TAF 304-80	AF/RDPF AFSC/SDWF ASD/RWW SAC/XPHN

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Electronic Warfare Support Measures	64710/ 2501	227 327	EC		TAC 24-70 TAF 315-75	AF/RDPE AFSC/SDWR ASD/RWT
Electronic Warfare Technology	63718/ 691X	372 374	EC		TAF 301-78 TAF 304-80 TAF 315-73 ESC 3-81 SAC 3-79 SAC 23-69	AF/RDPE AFSC/DLWA AFSC/AAWD AFWAL/AAWD TAC/DRWP
Embedded Computer Systems Improvement Program	71112	473	Si		AFLC 1-80	AF/LEYY
Emergency Locator Transmitter	(69023A) (68027A) (22124A)			C-141 C-130 O-2A	ESC 1-77	WR-ALC/MMSPGM WR-ALC/MMSF WR-ALC/MMMV MAC/XPQS
F-4G Inertial Navigation System	(19501B)	224	N	F-4G	TAF 315-80	OO-ALC/MMSR OO-ALC/MMSPM
F-4G Wild Weasel Squadrons	27136	224	EC	F-46	TAF 315-80	AF/RDPE AFSC/SDWD ASD/RWW TAC/DRWP
F-5E Update - APX 101, ARN 127, MXU-553, CAVR	(2998) (3104)	221	ID N CD	F-5E		WR-ALC/MMIMC
F-15 Improved Comm/Nav	61U001	221	C N	F-15		
F-15 Protective Systems	64739/ 5618	221 371	EC	F-15	TAF 9-68 TAF 304-80	AF/RDPE AFSC/SDWP ASD/RWW TAC/DWRP
F-15 Squadrons	27130/ 0131	341 221 223	TA/S		TAF 304-79 TAF 9-68	AF/RDPN AFSC/SDTS ASD/TAF TAC/DRFA
F-16 A-D	27133/ 2671	221 223	TA/S	F-16	TAF 303-76	AF/RDPN AF/SDTS ASD/XP TAC/DRFA

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
F-16E	27133/ 2835	223 221	TA/S	F-16E	TAC 3XXX-82	AF/RDPN AFSC/SDTF ASD/XP TAC/DRFA
F-16/ASPJ Development/ Integration	64737/ 2719	221 223 371	EC	F-16	TAF 303-76 TAF 304-80	AF/RDPE AFSC/SDWE ASD/RWW TAC/DRWP
F/FB-111 Avionics Intermediate Shop (AIS) Replacement	27129/ XXXXX	223	SI	F/FB-111		AF/LEYY
F/FB-111 Avionics Modernization Program	27129	223	TA/S	F/FB-111		AF/LEYYS
F/FB-111 Protective Systems	64738/ 5616	113 371	EC	F/FB-111	SAC 1-73	AF/RDPE AFSC/SDWE ASD/RWW SAC/XPHN TAC/DRWP
F-111 Squadrons PAVE TACK (VATS)	27129/ 2056 27433 (3013)	223	TA/S	F-111 F-4E	TAF 332-72	AF/RDPV AFSC/SDZ ASD/RWN TAC/DRAV SM-ALC/MMKREM
Fiber Optics Development	63726	225	SI			AF/RDST
Fighter Derivative	27132	221	TA/S	F-15 F-16		AF/RDPN

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Fire Control Avionics	62204/ 7629	TB 521	TA/S			AFSC/DLWA AFWAL/AART
Flare/Chaff Dispenser AWE-FCD	(3008) (2981)	223	EC	A-10A A-7D		SM-ALC/MMSREF ASD/TAX
Flight Control	62201/ 2403	TB 523	FL			AFSC/DLFF
Flight Data Recorder	(10603A)		CD	C-130	AFISC 1-79	WR-ALC/MMIRCA WR-ALC/MMSRBB MAC/LGMA
Flight Test Simulators	64735/ 6510	430 454	EC		TAF 305-76 ADCOM 5-77	AF/RDPE AF/RDPT AFSC/SDED AD/YI TAC/DRPS
Fuel Savings Advisory System (FSAS)	(10402B)	113	FL	C-135 C-5 C-141	SAC 10-79 MAC 6-79	WR-ALC/MMSRAB OC-ALC/MMSG WR-ALC/MMSH MAC/XPQS ASD/AEA SAC/XPHN
GPWS Update	(11608A)			C-141B C/NC-141A		MAC/LGMA WR-ALC/MMSR
HAVE QUICK UHF Radio	(3064)	345		A-10 A-7 C-130 C-141 C-5A F-111 F-15 F-16 F-4 H-3 H-53 OV-10	TAF 321-75 MAC 203-80	WR-ALC/MMIMC SM-ALC/MMKREM MAC/LGMA TAC/DRCG MAC/XPQS
Higher Order Language (HOL) Discipline	63728/ 2532	TB 551	SI			AFSC/DLAE AFSC/RADC
Indirect Identification Subsystems	64725/ 2751	344 221 223 254	ID		TAF 304-79	AF/RDST AFSC/SDTA ASD/AEI TAC/DRAA

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Industrial Preparedness	78011	DW 480	TA/S			AF/RDCM
Inertial Navigation System (C-IVE)	(2984)	361	N	C-135	MAC 1-74 SAC 5-75	OC-ALC/MMIMI MAC/XPQS
Inertial Navigation System Replacement	(10513B)		N	F-4		
Inertial Reference and Guidance Technology	62204/ 6095	TB 521	N			AFSC/DLWA AFWAL/AAAN
Inertial Reference Unit	(11304B)			F-111		
Information Science Technology	62702/ 5581	TB 521	SI			AFSC/DLAE
Infrared and Optical Countermeasures	64738/ 3829	371	EC		TAF 304-80	AF/RDPE AFSC/SDWE ASD/RWW SAC/XPHN TAC/DRWP
Integrated Attack Avionics	64212 4366	430 221 223 225	TA/S		TAF 312-77	AF/RDPT AFSC/SDTA TAC/DRAV
Integrated Communication Navigation Identification Avionics (ICNIA)	63253/ 2538	TB 551	C			AF/RDPV AFWAL/AAAI
Integrated Avionics (IDA)	64201/ 2658	AS 223	SI			AF/RDPV AFSC/SDB
Integrated Flight Demonstrator (IFD)	63253/ 2735	TB 551	SI			AF/RDPV AFWAL/AAAS
Integration Facility for Avionics System Test (IFAST)	64755/ 2873	454	SI			AF/RDPT

AVIONICS PROGRAMS AND REFERENCES

PROGRAM	NUBMER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Intelligence Technology	62702/ 4594	TB 521	RE			AFSC/DLAE
Jam Resistant Data Link Technology	63727/ 2345	227 327 345	C		TAF 320-79 MENS	AF/RDPV AFWAL/AAAI
Jam-Resistant Secure UHF Voice Communication	27423/ 2277	345	C		TAF 321-75 AFCC/MAC 203-80	AF/RDPV AFSC/SDEC ESD/DZY MAC/XPQS TAC/DRCG
Joint Inter-operability of Tactical Command and Control Systems (JINTACCS)	64779	341 342 343 344 345	C		TAF 306-74	AF/RDST AFSC/SDEL
Joint Tactical Information Distribution System (JTIDS)	64754	341 342 343 344 345	C	E-3A F-15	TAF 306-74 JOR SM-38-81	AF/RDST AFSC/SDEC ESD/DCB TAC/DRCC
Joint Technical Coordinating Group For Aircraft Survivability (JTCG/AS) Support	63244/ 2251	225	EC			AFSC/DLFF
JOVIAL Language Control Facility	64201/ 2560	AS 223	SI			AF/RDPV AFSC/SDB ASD/AXT
KY-58/Nuclear Hardened Secure Voice	(3070) (3025)	345 364	C	C-130 C-135 F-111 OV-10A A-10A 0-2A C-9 F-4	ESC 1-77	WR-ALC/MMMV OO-ALC/MMSPM MAC/XPQS

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PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
KY-75 Secure Voice	(3070) (3063)	345 364	C	C-135 C-130 C-137 C-141 C-5A C-9A	ESC 1-77	WR-ALC/MMMV MAC/XPQS
Laser Hardened Materials	63211/ 2100	TB 553	TA/S			AFSC/DLFF
Lincoln Labora-tory	63250	TB 551				AF/RDST
Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN)	64249/ 2673	223	TA/S	F-16	TAF 302-81	AF/RDPV AFSC/SDZS ASD/RWN
Low Altitude, Radar Altimeter (LARA) Multiplexer	(17305A)		N	F-111A FB-111A		SM-ALC/MMKREM TAC/DRFG
Incorporate Voice Warning	(10571A)			F-4		
Low Probability of Intercept Communication Technology	63727/ 2746	345	C		TAF 321-75	AF/RDPV AFWAL/AAAI
MA-2 Automatic Flight Control	(18420B)		FL	B-52G B-52H		OC-ALC/MMHRM OC-ALC/MMGHM
MAC Command/ Control System	41840	341	C	MAC 201-79		AF/XOKS
MADAR DRU	(27248B)			C-5		
Management Control Technology	64740/ 2523	C^3	SI		AFLC 1-80	AF/RDPV ESD/TOIT
MARK XII Identification Friend or Foe (IFF) IMP	64725/ 2463 (3112)	CA 221 223 227	ID	F-16 F-15 A-10 F-4	TAF 304-79	AF/RDPV AFSC/SDTA ASD/AEA TAC/DRAA

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Microelectronic Technology	642204/ 6096	TB 521	TA/S			AFSC/DLWA AFWAL/AADE
Microwave Landing System (MLS)	35114/ 2759	361	N		AFCC 802-78 JMENS	AF/RDST
Microwave Technology	62204/ 2002	TB 521	TA/S			AFSC/DLWA AFWAL/AADM
MILSTAR	33603	333 363	C		SAC 8-79 JMENS 5-79	AF/RDSS TAC/DRCC SAC/XPFR
Mission Data Preparation System (MDPS)	11113/ 2824	113	SI	B-52G B-52H	SAC 6-85	AF/RDQB AFSC/SDB SAC/XPHN ASD/YYH
Mission Engineering Support	64735/ 2152	430 454	EC		TAF 305-76	AF/RDPT AFSC/SDWE AD/YI TAC/DRPS
MKX-383 IMP Flight Recorder	(19608A)		CD	C-141		WR-ALC/MMIRCA MAC/LGMA
Modular Automatic Test Equipment (MATE)	64247	DW	SI			AF/RDPV AFSC/SDTA ASD/AEC
Monopulse Radar Countermeasures	64738/ 2683	113 371 221 223	EC	B-52 FB-111	SAC 3-79 SAC 6-81 SAC 10-81 TAF 9-68 TAF 303-76 TAF 304-80	AF/RDPE AFSC/SDWE ASD/RWH TAC/DRWP SAC/XPHN
NAVSTAR Global Positioning System (GPS)	64778, 35164	361	N		USAF 3-78 USAF MENS 6-79	AF/RDST AFSC/SDSS SD/YE TAC/DRAV SAC/SXRS

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Noncooperative Identification Sub-systems	64725/ 2597	344 221 223	ID	F-15 F-16	TAF 304-79	AF/RDPV AFSC/DLWA AFWAL/AART TAC/DRAA
Noncooperative Identification Techniques	63742/ 1177	344 221 223	ID		TAF 304-79 JMENS	AF/RDPV AFSC/DLWA AFWAL/AART TAC/DRAA
Nuclear Hardness/Elect-romagnetic Pulse (EMP)	11113/ 2548	113	TA/S			AF/RDQB AFSC/SDB SAC/XPHN ASD/YYH
Nuclear Effects Simulation Test Facilities	64747/ 1209	454	TA/S			AF/RDPT AFSC/DLWM
Offensive Avionics Suite(OAS) CMI, AP-101C, APN-218, APN-224, ASK-7, ASN-134, ASQ-175, ASQ-176, AYK-17	(3023)	113	SI N	B-52G B-52H	SAC 6-75	OC-ALC/MMHH WR-ALC/MMIMD ASD/YYH SAC/XPHN
Optical Counter-Counter Measures (OCCM)	63750/ 2347	113 371 551	TA/S		SAC 4-76	AF/RDQA AFSC/DLWA AFWAL/AARI SAC/XPHN
PAVE MOVER	63747	RI	TA/S		USAF 10-82	AF/RDPV AFSC/SDWR
PAVE MOVER Interfaces	64616/ 2727	223	TA/S		MENS USAF 10-82	AF/RDPV ESD/XRT ASD/XRS TAC/SMO/PLS AFSC/SDWR
PAVE MOVER Radar/Fire Control	64616/ 2814	223	TA/S		MENS USAF 10-82	AF/RDPV ESD/XRE AFSC/SDWR ASD/XRS TAC/SMO/PLS
PAVE TACK	(2917)	227 327	RE TA/S	RF-4C		

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
PAVE TACK Video Augmented Tracking System (VATS)	27129/ 2056	223	TA/S	F-111 F-4E	TAC 332-72	AF/RDPV AFSC/SDZ ASD/RWN TAC/DRAV SM-ALC/MMKREM
Passive Electronic Counter Measures	62204/ 7633	TB 521	EC			AFSC/DLWA AFWAL/AAWP
Policy and Procedure Guidance	64740/ 2524	C^3	SI			AF/RDPV ESD/TOIT
Post Attack Command and Control System PACCS	11312	331 C^3	C	EC-135	SAC 02-79	AF/RDSS
Precision Location Strike System (PLSS)	64742/ 1190	224 373 374	EC	F-16A F-4E	TAF 314-74 MENS	AF/RDPV AFSC/SDWD ASD/RWS TAC/SMO/PLS
Productivity, Reliability, Availability, Maintainability (PRAM)	78026	DW 473	TA/S			AF/RDPT AFSC/SDTA ASD/AEM
Radar programmable Signal Processor	64201/ 2519	221 344 223	TA/S	F-15 F-16 B-1B	TAF 302-81 AF 9-76 TAF 307-81	AF/RDPV AFSC/SDB ASD/RWN TAC/DRAV
Radar Receiver I	(10310B)			F-111		SM-ALC/MMKREM
Rada Redesign	(18316B)			F-111D		SM-ALC/MMKREF SM-ALC/MMIR
Radar Target Scattering Facility (RATSCAT)	65708/ 2900	451	TA/S			AF/RDPT

ANNEX A(CONT)

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
Radar Warning Receiver LRU-3 Test	62145B	221	EC	F-15		
Radar Warning Receiver	(10613B) (3088)	113 223 261 221 227	EC	HH-53 A-10 A-7 C-130 B-52 OV-10 RF-4C F-4E		
Radar Upgrade	11408B	113	TA/S	B-52G B-52H		
Range Equipment	64735/ 2286	454	EC		TAF 305-76	AF/RDPT AFSC/SDED TAC/DRPS AFSC/SDWE AD/YI
Reconnaissance Sensors/Processing Technology	63208/ 665A	223 551	RE		TAF 302-81 TAF 320-79 USAF 1-79 SAC 11-79	AFSC/DLWA AFWAL/AAR-1
Requirements Analysis	64740/ 2522	C^3	C		AFLC 1-80	AF/RDPV ESD/TOIT
Side Looking Airborne Radar (SLAR) Sensors	64756/ 2037	227 327	RE		TAF 315-75	AF/RDPJ AFSC/SDWR ASD/RWT TAC/DRFA
Signal Data Converter	10309B	221 223	TA/S		F-111D F-111F	
Simulation Analysis and Evaluation	64738/ 1627	113 327 221	EC		SAC 3-79 TAC 9-68	AF/RDPE AFSC/SDWR ASD/RWW
SIMVAL	35887	374 430 454	EW		TAF 305-76	AF/INW TAC/DRPS
SINCGARS-V Integration	27423 2614	345	C		TAF 308-80	AF/RDPV AFSC/SDEC ESD/DCY TAC/DRCC

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
SLAR Exploitation	64756/ 2451	RI	RE			AF/RDPJ AFSC/SDWR ASD/RWT TAC/DRCA
Software Life Cycle Costs	63728/ 2527	TB 551	SI			AFSC/DLAE
Standard Avionics	64201/ 2257	223				AF/RDPV AFSC/SDB ASD/XRS ASD/AXT SAC/XPHN
Stall Inhibit System (SIS) Computer	(13315A)		FL	F-111		SM-ALC/MMKREF SM-ALC/MMKREM
Standard Central Air Data Computer (SCADC)	64201/ 2771 (41652B)		SI	A-7 C-141 F-111 F-4 KC-135		AF/RDPV AFSC/SDB ASD/XRS ASD/AEA MAC/LGMA TAC/DRAV
Station Keeping Equipment (SKE)	(3033)	261		C-130 C-141	MAC 310-74 MAC 1-78 MAC 5-80	MAC/XPQS MAC/LGMA SAC/XPHN
Strategic Radar	11113/ 2601	113	TA/S		SAC 6-75	AF/RDQB AFSC/SDB AFWAL/AARM SAC/XPHN ASD/YYH
Surveillance Technology	62702/ 4506	TB 521	RE			AFSC/DLAE
Survivability/ Vulnerability (S/V) Assessment of Aerospace Systems	64711/ 3763	333 113	TA/S		SAC 2-79	AF/RDQI SAC/XPFS

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
S/V Assessment of C^3 Systems	64711/ 2485	333	C		SAC 2-79 SAC 2-75	AF/RDQI SAC/XPFS
Systems Analysis/ Demonstration	63431/ 2029	333 345	C		JMENS 5-79 SAC 8-79 SAC 11-79 TAF 305-75	AF/RDSS SAMSO
System Support	35114/ 2026	C	N			AF/RDST
T-46A Next Generation Trainer (NGT)	64313	225			ATC 1-78 MENS	AF/RDQL ASD/AFG
TAC Support Aircraft	(3015)	372		EF-111A	TAF 315-73	SM-ALC/MMKREF TAC/DRWS
Tactical Airborne Command and Control System (E-3A)	27417	340	C	E-3A	TAC/ADC 1-66	AF/RDPN AFSC/SDEC ESD/YW TAC/DRCA
Tactical C^3I Architecture	63789/ 2478	TB 551	C			AF/RDST
Tactical Electronic Reconnaissance (TEREC)	64710/ 2704	227 327	RE		TAC-24-70	AF/RDPE AFSC/SDWR TAC/PRFR
Tanker Transport Bomber (TTB)	64233	140 225 430	SI		ATC 1-78	AF/RDQL ASD/AFG
Target Recognition Technology For LANTIRN	63249/ 2882	223	TA/S		TAF 302-81	AF/RDPV AFSC/SDZS
Technology For Reconnaissance And Targeting Avionics	62204/ 2004	TB 521	TA/S			AFSC/DLWA AFWAL/AAR
Terminal Segment Technology	63431/ 1227	333 363	C		SAC 8-79 SAC 11-79 TAF 305-75	AF/RDSS SAMSO SAC/XPRF

ANNEX A(CONT)

AVIONICS PROGRAMS AND REFERENCE

PROGRAM	NUMBER	MISSION AREA	FUNCT AREA	A/C	STATEMENT OF OPERATIONAL NEED	POINT OF CONTACT*
UPD-4 Enhancement	(3011)		RE	RF-4C		OO-ALC/MMSRH ASD/RWT
Very High Speed Integrated Circuits (VHSIC)	63452/ 2700	TB 551	TA/S			AFSC/DLWA AFWAL/AAD
Very Low Frequency/ Low Frequency Improvements	33131/ 2832	333	C		SAC 7-71	AF/RDSS AFSC/SDEC ESD/YSL MAC/XPQS SAC/XPFC
Warning and Power Management Systems Technology	63718/ 2432	113 371 374	EC		SAC 3-79 TAF 304-80 TAF 315-73	AF/RDPE AFSC/DLWA AFWAL/AAWD TAC/DRWP SAC/XPHN
Warning Systems	64739/ 2273	221 371 374 224 551	EC		TAC 9-68 TAF 304-80 TAF 312-80 MAC 07-81 MAC 08-81 MAC 09-81	AF/RDPE AFSC/SDWE ASD/RWW TAF/DRWP TAC/PDWX
Weapon/Navigation Computer	(19304B)			F-111		SM-ALC/MMKREM SM-ALC/MMKRRF SM-ALC/MMSRE
XBand Transmitter Assembly	(18246B)			F-106A		SM-ALC/MMSF

AVIONICS POINTS OF CONTACT

OFFICE	PHONE
USAF (AV 22X-XXXX)	
RDQB	52616/57153
RDSS	59640/59641
RDPV	77715/77716
LEYY	71177/73805/50844
LEYYS	50844
RDPN	57866/57867(F-15)
	53891/52969(A-10)
	74434/52969
	(DERIVATIVE)
	57870/57871(F-16)
	59826/59827(E-3A)
RDPE	70660/70528/57320
	57099/57326
RDPT	44590/44591
RDST	48250/48251
INW	54700/56105
XOKS	54442
RDQT	43960/43961
RDQA	73628/73629
RDQ-B1	43816/43819
RDQL	74138/75012
RDQI	56052/72335
RDPJ	59451/59495
RDCM	77579/78850
AFSC (AV 858-XXXX)	
SDB	3248/7229
DLF	5771
DLFF	5771
DLWA	4362/2472
DLAE	7164/4634
DLS	2938/2366
SDWE	7151/7189/4968
XR	5065/6030
SDTA	3487
SDWP	7151
SDEC	4224/6184
SDWS	4967
SDWR	6868/6767
SDWD	4967
SDTS	5171
SDTF	4926
SDED	7485
SDSS	3194
SDZS	4096/7341
SDZ	7341
SDN	4773/5101

OFFICE	PHONE
ASD (AV 785-XXXX)	
AEA	6611
AEG	2996
AEI	3810
AEM	6201
AF	6306
AFG	5973
AFN	3703
AFZ	2896
AX	2734
AXA	5385
AXP	5694
AXS	5945
AXT	5941
B1	3281
RWH	6100
RWJ	6401
RWN	7273
RWS	3225
RWT	5571
RWW	4917
RWY	5131
TAF	4263
TAX	3259
XRS	3164
YP	6151
YYA	5080
YYH	2904
ESD (AV 478-XXX)	
YSL	1001/MITRE 4730
DCK	1001/MITRE 2390
TOIT	2992 2922
YS	1001/MITRE 2304
DCB	5724
DCY	2444/4934
YW	4418
SD (AV 833-XXXX)	
YKA	1304
YE	1526
AD (AV 872-XXXX)	
YI	4241/4242
RADC (AV 587-XXXX)	
RADC	2204

OFFICE	PHONE
AFWAL (AV 785-XXXX)	
AAA	5218
AAAI	4666/4947/4742
AAAN	2495
AAAS	4854/4827
AAD	7142
AADE	3423
AADM	4831
AADO	3912
AAR	6144
AARI	5292
AARM	7371/4609/5359/6427
AART	5144/2713
AAR-1	6141
AAWD	6650/2862/3498
AAWP	6127
AAWW	5579
FIGX	4819
FII	4778
AFLC (AV 787-XXXX)	
LOW	6637
SA-ALC (AV 945-XXXX)	
MMSF	6148
MMSG	6206
SM-ALC (AV 633-XXXX)	
MMKREF	2452
MMKREM	2590
MMSRE	2454
MMCRAC	2654
OC-ALC (AV 735-XXXX)	
MMSG	5836
MMSF	7671/3547
MMIMC	2318
MMHRMA	6025/3371
MMHHM	3573
MMGHM	3251
MMIMAC	2318
MMHHA	3573
MMIMI	3980
MMHH	5369/5373
MMZA	5661

AVIONICS POINTS OF CONTACT

OO-ALC (AV 458-XXXX)

OFFICE	PHONE
MMIPM	7874
MMSR	6164
MMSPM	5436/5866
MMSRH	4137/4138

WR-ALC (AV 468-XXXX)

OFFICE	PHONE
MMRMT	6136
MMSH	2686/3634
MMSRAB	2922
MMSRBB	6281
MMIRCA	3737
MMIMD	3287
MMIMC	3675
MMSPBM	2767
MMIRBB	2511
MMIMF	3271
MMRMS	5804
MMSF	6475
MMMV	6461
MMA-1	6176
MMSL	2635
MMSPGM	2767

SAC (AV 271-XXXX)

OFFICE	PHONE
XPHN	3251/6124
XPFS	3189
XPHD	4485
XPRF	5682

MAC (AV 638-XXXX)

OFFICE	PHONE
XPQS	3908
LGMA	2059

TAC (AV 432-XXXX)

OFFICE	PHONE
DRAV	7965/5914
DRWS	4888
DRCG	3951
DRFG	5831
DRFR	5831
DRWP	7490
DRWX	4888
DRAA	5914
DRPS	5892
DRFA	5754
DRCA	5527/4422
DGXX	2953
SMO-PLS	3572

ANNEX B

AVIONICS DEVELOPMENT PROGRAMS

This annex provides the current plans for avionics development programs (including schedules and brief descriptions.) Programs are arranged in program element numerical order.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
11113/2406, B-52 Offensive Avionics System (OAS) Update	Provides an avionics update for the B-52. Program includes an improved heading system, high accuracy inertial navigation system, digital data processing and a new data bus; integrated control and displays; a new doppler; a new radar altimeter and a reliability modification to the current forward looking radar.	IOC of one B-52 squadron with Air Launched Cruise Missiles and Offensive Avionics System - Dec 82
11113/2548, Nuclear Hardness Study/Electromagnetic Pulse (EMP)		RDT&E - FY82/83 Subsequent plans to be determined following testing.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
11113/2601, Strategic Radar	Engineering development, flight test, evaluation and qualification of a radar update for the B-52G/H weapon system.	Radar Update CDR - FY83 Start Antenna Modification FY-83 Flight Test - FY84 Start Aircraft Modification - FY85
11113/2692, B-52 Autopilot	Provide design, fabrication and integration of a new flight control and a new heading system for the B-52 G/H in response to current supportability and safety of flight problems.	PDR - FY83 Flight Test -FY84 Modification Kit Procurement - FY84-88 B-52 G/H Modification Start - FY85
11113/2824, Mission Data Preparation System (MDPS)	Corrects inefficiencies in the application software developed under separate Offensive Avionics System (OAS) and Air Launched Cruise Missile (ALCM) programs.	Definition/Development - FY82/83 Development/Testing - FY84/85
11312 Post Attack Command and Control System (PACCS)	Provides DT&E for improvements required to assure EMP Survivability of Strategic C^2 systems. FY-83 funds are for the E-4 program. Starting in FY-84, E-4 funds are in PE 32015. This PE is primarily in support of the EC-135 program.	Initiate EMP Surveillance Program - Sep 82 EC-135 Baseline EMP Analysis - Dec 82 Initiate Program to Acquire an integrated C^3 suite to replace existing EC-135 suite - Oct 85.

AVIONCIS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
27129F, F/FB-111 Avionics Modernization Program	Program consists of updates to the attack radar, terrain following radar, inertial navigation, control and displays, and doppler radar systems. This update consists of the addition of the weapons navigation computer (A/E/EF) and the multiplex converter (A/E/EF) along with updates to the attack radar, terrain following radar, and controls and displays.	Radar Software Development Initiation - Oct 83 System Integration Testing - Oct 84 DT&E/IOT&E - May 85 Production Decision - Jul 85
27129/XXXX, F/FB-111 Avionics Intermediate Shop (AIS) Replacement	Provides new automatic test stations to replace the existing AIS test stations. RDT&E funds will be used primarily for development of computer software which will test the aircraft avionics components on the new test stations.	Contract Award - Dec 82 First Delivery - Dec 84 IOC - Mar 86
27129/2056, F-111 Squadrons, PAVE TACK Video Augmented Tracking System (VATS)	Improves PAVE TACK tracking accuracies by developing and testing VATS. Provides for additional engineering changes and improvements to the PAVE TACK system.	First Delivery F-111 AIS Test Sets - Sep 84 IOC F-111 AIS Test Sets - Dec 85.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
27130/0131, F-15 Squadrons	On-going development test and intergration in support of F-15 enhancements currently being addressed in an F-15 Multi-Staged Improvement Plan. Avionics enhancements under consideration include integration of the Programmable Armament Control Set and interface development with AMRAAM, JTIDS, and AIM-7M; continued development and test of electronic warfare updates; and design/development of communications command and control interfaces	Integration Efforts - FY83-87
27131, A-10 Squadrons	On-going development, test, and integration in support of A-10 enhancements, such as HAVE QUICK, LANTIRN integration, and development of two-seat A-10B trainer.	A-10B First Delivery - Jul 84 Flight Test Support for LANTIRN FY83-87
27132, Fighter Derivative	A need exists for around-the-clock air-to-air and air-to-surface tactical aircraft capable of long range all weather intercept and under/in weather interdiction to counter the increasing capabilities of threat systems which operate at low level in poor weather conditions. This aircraft will be developed as a F-15 or F-16 derivative.	F-15/F-16 Comparative Demonstration -FY82/83 Development Tasks - FY84 Avionics Ground and Flight Tests, Qualification, SE, IOT&E - 85 through 88.
27133/2671, F-16 A-D	Supports multiple enhancements to the current F-16 as detailed in the Multinational Staged Improvement Plan (MSIP). Planned avionics enhancements include improved radar, and pilot/system interface in night/weather operations. AMRAAM is the primary weapons enhancement being considered for the air-to-air role.	Delivery of 651st A/C - Sept 83 Delivery of 1st MSIP Aircraft - Jul 84 Integration of AMRAAM - FY84 MSIP Retrofit Kits - FY85-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
27133/2835, F-16E	Provides development of F-16E configuration. The F-16E will incorporate the same avionics as the basic production F-16 MSIP Stage II/III systems and related operational enhancements. Radar PSP/DMT enhancements will include automatic terrain following, synthetic aperture and slow moving target track modes.	F-16E/F-15 Comparative Flight Evaluation - FY84
27136, F-4G Wild Weasel Squadrons	Improving the capabilities of wild weasel aircraft.	FSED Contract Award - FY82 Phase I IOC (Computer Expansion) - FY85 Phase II IOC (High Density/Exotic Threat Capability) - FY87
27417, Tactical Airborne Command and Control System (E-3A Portion only)	Develops basic E-3A configuration and selected enhancements. Supports NATO AEW&C Program (NATO version of USAF E-3A). DSARC III go-ahead was based on USAF intent to complete C^3 and ECCM improvements.	C^3 Improvements Retrofit Start - Sep 84 C^3 Improvements Development Complete - Dec 84 C^3 Improvements Retrofit Complete - Nov 87 Last US A/C Delivered - Mar 91
27423/2277, JAM Resistant Secure UHF Voice Communications	Develops UHF communication capability responsive to the jamming environment of mid 1980s and beyond.	DSARC - Feb 83 Restart FSD - Mar 83 Complete FSD - FY86 DT&E/IOT&E - FY86 Initial Production Deliveries - FY87 IOC - FY88
27423/2614, SINCGARS-V Integration	This program integrates the Army SINCGARS-V technology into tactical aircraft. The program insures interoperability with other services/ NATO using SINCGARS-V	Antenna Installation Studies - FY83 Participate in Army DT&E/IOT&E - FY83 Develop Air Force Unique Airborne Equipment - FY85-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
32015/2211, E-4 Block I	Retrofit of E-4A to E-4B. Advanced C^3 and nuclear hardening will be included in the retrofit.	Delivery of First Retrofit A/C - Jul 83 PMRT - Oct 83 Second Retrofit - May 84 Final Retrofit - Jan 85
32015/2212, E-4 Block II	Effort designed to insure that the E-4B maintains compatibility with the existing and evolving WWMCCS. Includes addition of new systems and updating of existing systems for performance and supportability.	Start development and engineering task for multiple SHF channels and up link - FY83. Prototype SHF Channel Modification - Mar 85. Prototype SCT Modification - Mar 85

ANNEX B

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
33131/2832, MEECN VLF/LF Improvements	This program supports the requirement for an improved survivable low frequency communications system.	Production Contract (100 KW Transmitter) - FY82 Production Contract (TE Antenna) - FY82 Development Contract Award (DRE) - FY82 Development Contract Award (Bomber Receivers) - FY82 On-Going Development/Production - FY83-86
33131/2833, MEECN Adaptive HF/VHF	A two phased program is planned. Near term efforts will be to upgrade Scope Signal, pacer automatic frequency selection, and jamming avoidance. For the mid to long term, a modular family of radios will be developed such that each user would procure the basic radio with add-on-modules appropriate to mission needs.	FSD Start - FY83 Development and Test of Modular Radio - FY83-88 Production of Modification Kits for ARC-190 - FY85-89
33144, Electromagnetic Compatibility Analysis Center (ECAC)	Provides facilities and manpower to perform system level Electomagnetic Compatibility (EMC) analysis, spectrum engineering and EMC operational support. Provides support in assessing EMC of US and NATO communications electronic systems.	On-Going EMC support for 225 separate DOD projects
33401, COMSEC	Provides communications security (COMSEC) RDT&E. The goals are to reduce costs by consolidating COMSEC needs for joint development and to apply automation technology to reduce security assessment manpower requirements.	Developments include: Narrowband voice processing; automation and instrumentation for tempest testing; fiber optics technology, a Ground Radio Interface Device (GRID) for VINSON Secure Voice - FY82-83 Transition narrowband voice techniques to hardware; develop standard algorithms; continue tempest testing and evaluation. - FY84 Continue technology base efforts -

ANNEX B

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
33601, Air Force Satellite Communications (AFSATCOM)	Consolidates development and procurement of airborne/ground terminals and satellite communications hardware for NCA-JCS-CINC forces C^3.	Complete installation of UHF terminals in FB-111/EC/RC-135 and majority of B-52s; Continue installations in E-4B and KC-10; Award Contract for SCT Injection Subsystem; Continue developments for improved jam resistance for UHF terminals and integration of Command Post terminals with MILSTAR; Initiate Concept Validation for LCC EHF receive capability - FY83
		Continue FY83 tasks; Award production contracts for force element terminal upgrades and begin deployment; initiate FSD for LCC EHF receive capability; Complete all UHF terminal installations - FY84
		Complete installation of SCT Injection Subsystem and terminal upgrades; Initiate command post terminal upgrades; Begin installation of EHF receive capability in LCCs. - FY85-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
33603, MILSTAR	Develops and acquires a satellite system (MILSTAR) and EHF satellite terminals for strategic and tactical air forces.	FSED Source Selection - FY83 Continue development initiated in FY83. - FY84
35114/2026, System Support	Provides necessary TDY and study contract efforts to define future programs and integrate on-going activities within the Traffic Control and Landing System (TRACALS) efforts (P.E. 35114). Programs with avionics impact include 35114/2759, Microwave Landing System (MLS).	Conceptual studies; Liason with FAA/Army MLS programs; Define FY85 new starts; arrange joint program with FAA for radar display upgrades and AN/MPN-14 replacement - FY83-84 Determine/implement adjustments to TRACALS program necessitated by implementation of the FAA programs - FY85-88
35114/2759, Microwave Landing System	Provides necessary Air Force program activity to transfer from precision approach radar (PAR) and instrument landing system (ILS) to use of a precision microwave landing systems (MLS). The Air Force will exploit previous and current development efforts by the FAA, Navy, and Army for both avionics and ground equipment development and acquisition.	Tactical System Development Contract - FY2/84 OSD Decision DOD Implementation - FY3/85 Production Decision on Tactical System - FY4/86 Initiate Joint Procurement with FAA-FY1/87 Begin Engineering Development of Military Avionics and NATO ground system - FY1/87 Begin retrofit of MAC aircraft - FY4/88 Tactical System IOC - FY2/89 Fixed base installations and fleet avionics retrofit - FY90-98 Phased out PAR/ILS - FY95-2000

AVIONICS DEVELOPMENT PROGRAMS

PROGRAMS	DESCRIPTION	MILESTONES
35164, Global Positioning System (GPS) User Equipment	Provides GPS user equipment integration engineering for all Air Force aircraft.	User Equipment IOT&E - FY 83-84 DSARC III - FY84 User Equipment Production start - FY84 IOC - FY88
35887, SIMVAL	SIMVAL provides intelligence support to Electromagnetic Combat through the validation of threat simulators. This program is required to insure that EW threat simulators are duplicating the most current intelligence threat estimate. EW threat estimate. EW threat simulator parameters are compared with the most current intelligence information to document operating differences which could affect equipment development and training. This validation requirement applies to approximately 80 out of 200 currently fielded simulators as well as new simulators in the acquisition cycle. This was an FY 82 new start. Previous efforts were conducted under P.E.s 64735 and 64738 prior to transfer to 35887.	

AVIONICS DEVELOPMENT PROGRAM

PROGRAM	DESCRIPTION	MILESTONES
35887, Electronic Warfare Data Base	Provides data base support for reprogrammable EC equipment updates.	On-Going Activity
41840, MAC Comand and Control (C^2) System	Provides for upgrade of MAC C^2 system including near term fixes for the present system and mid and far terms upgrades. This program is an outgrowth of the WWMCCS Architecture work and on-going studies at MAC. Improvements will include ground and airborne radio anti-jam capability, enhanced timeliness of information flow, increased secure voice capability, global communications and decentralized information processing.	Complete Detailed Program Plan - FY84 1st Qtr Complete Requirements Definition - 3rd Qtr/FY84 Product Contract Award - 1st Qtr/FY85 Prototype System Installation 1st Qtr/FY86
62201/2403, Flight Control	Develops and demonstrates technology in the areas of flight control systems, aerospace vehicle simulation and analysis, controls and displays, cockpit configuration, stability and control, low visibility terminal operations, flight control integration with propulsion/navigation/weapon delivery subsystems and preparation of specifications and handbooks.	Development of more reliable flight control components; Development of improved mechanical, hydraulic, electrical, and fly-by-wire components; Develop multi purpose sensor packages - FY83 Flight Control System Integration - FY83-88 Develop technical base for blended manual/automatic in-weather multiple target attack; develop tactical flight management, flight path control and sensor blending to minimize detectability at low altitude - FY85-88

AVIONICS DEVELOPMENT PROGRAM

PROGRAM	DESCRIPTION	MILESTONES
62204/2000, Active Electronic Counter-measures	Addresses needs of operational aircraft for countermeasures against a broad threat spectrum to enhance survivability and mission effectiveness.	The following areas will be addressed in FY83: (1) Terminal radar threat negation; (2) Early warning and acquisition threat degradation; (3) Visual and electro-optical threat degradation; (4) IR threat degradation; and (5) C^3 ECM.
62204/2001 Electro-Optical	Develops laser sources, electro-optical detectors, and optical signal processing components and techniques to support a wide range of detection, tracking, guidance, and defensive systems. Pursues technology efforts in the areas of: tunable solid state and gas laser sources; advanced imaging infrared arrays; components for laser radars; and integrated optical systems for compact, inexpensive signal processing.	The following efforts will be accomplished in FY83: (1) Complete evaluation of wave-length agile Alexandrite laser. Continue investigation of all solid-state wavelength agile near-IR sources. Demonstrate greater than 3 watt output high density GaAlAs laser diode array. Investigate feasibility of 0.6-0.8 micrometer solid-state tunable laser. (2) Initiate development of 1000 element by 1000 element CCD liquid crystal light valve. Complete demonstration and evaluation of bistable optical devices for signal processing applications. Begin development of low loss integrated optical waveguide structures. Begin development of more efficient, wider bandwidth Bragg cells. (3) Begin development and evaluation of silicon avalanche photo-diode near-IR detector array. Continue development of CO_2 laser radar detector array for 200°K operation. Continue investigation and development of focal plane array (FPA) technology. Demonstrate enhanced image quali-ties with on-FPA signal processing. Demonstrate reduced cross section 3-5 micro-meter arrays. (4) Demonstrate fully computer-controlled IR focal plane array evaluation facility. Complete characterization of Alexandrite lasers.

AVIONICS DEVELOPMENT PROGRAM

PROGRAM	DESCRIPTION	MILESTONES
62204/2002 Microwave Technology	Develops solid-state and thermionic sources; sensing, amplification, and signal processing components; and circuit and system concepts at microwave frequencies. Pursues technical efforts to develop GaAs field effect RF transistors and amplifiers; develops millimeter wavelength power generator; develops ECM/radar antenna and array technology; develops monolithic microwave circuit and active element technology; and investigates emerging approaches for millimeter wave sources.	The following efforts will be accomplished in FY83: (1) Continued development of higher power GaAs FET technology and GaAs IMPATT diodes for microwave and millimeter wave frequenices; Investigation of MBE and MOCVD materials growth techniques for millimeter wave silicon and GaAs diodes; (2) Completed development of two stage L-band cross field amplifier; Initial development of high power 8-18 GHz TWT; Initial development of millimeter wave gyro-TWT and peniotron; (3) Initial development of a wideband 60 GHz amplifier for satellite applications, a 94 GHz transceiver, and circuit techniques and processing for two terminal devices in millimeter wave monolithic circuits. (4) Demonstration of multi-octave microwave array; Initial development of advanced solid-state X-band transmit/receiver module and high current DC power sources with greater than 2500 hour MTBF for 2000 element array; and (5) Continued to support for inter-service coordination and cooperation in the development of electron devices and components through the Advisory Group on Electron Devices (AGED).

AVIONCIS DEVELOPMENT PROGRAM

PROGRAM	DESCRIPITON	MILESTONES
62204/2003, Avionics Systems Design Technology	Performs exploratory research to develop advanced system avionics designs and integration techniques, support and enhance the facilities to simulate and evaluate these systems designs. Pursues technical efforts to develop generic avionics data and signal processing technology; develop software tools and environments to support lower cost, more reliable avionics software; develop high capacity information transfer and display systems for avionics; develop advanced system architectural concepts and their simulation hardware and software. Related IR&D projects: C.S. Drapper Labs, #110-1981, Navigation and Fire Control for Tactical Aircraft; General Dynamics/Fort Worth #800006638, Advanced Avionics	The following efforts will be accomplished in FY83: (1) Continued simulation support as required for development and evaluation of laboratory programs, including a SAR simulator; (2) Continued maintenance and configuration management support for the AVSAIL facility; (3) Initial development of a generic signal processing architecture for a wide spectrum of avionics applications; (4) Complete development of MIL-STD-1750A code generator on prototype Ada compiler; Acquisition of the Army's ALS Ada compiler and begin rehost effort on the AVSAIL VAX 11/780; Initial development of MIL-STD-1750A code generator for ALS rehosted compiler; (5) Completed development of the Airborne Electronic Terrain Map System (AETMS) Brassboard; Demonstration of AETMS and initial evaluation of real time digital map applications; Completed HUD Technology Demonstration; (6) Initial development of system definition for functionally integrated avionic systems.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
62204/2004, Technology for Reconnaissance and Targeting Avionics	Develops electro-optical and infrared systems for real-time reconnaissance, automated target detection, classification and targeting, and aircraft navigation and defense. Pursues technical efforts in techniques for target pattern recognition, advanced EO/IR sensors, reconnaissance processing technology, and advanced FLIR systems with wider field of view, higher resolution, and multiple functions.	FY83 efforts include Upgrades to Targeting Systems Characterization Facility (TSCF) by provision of higher order language capabilities; Initial efforts to enhance the capability of CO^2 laser radar sensors and imagery to enable automatic target acquisition and tracking of moving and stationary multiple tactical targets, and precision weapon steering; Initial development of a multifunction FLIR for pilotage and target acquisition; Continued development of Multiband Staring Sensor; and Continued development and maintenance of a capability to analyze, simulate, and evaluate advanced strategic and tactical reconnaissance sensors and systems.
62204/6095, Inertial Reference and Guidance Technology	Develops improved accuracy inertial navigation systems, and low-cost inertial components for high volume applications. Pursues the development of high precision accelerometers and gyroscopes, low cost molded thermoplastic inertial components, and mathematical techniques and modelling for error compensation.	FY83 efforts include Initial development of high precision molded inertial systems and RLGs; Continued development of a frequency domain processor for radio navigation and potential ICNIA applications; and Continued gravity modelling and compensation efforts for improved INS performance.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
62204/6096, Microelectronics Technology	Exploits selected solid state device and circuit technologies to achieve advances in information processing capacity, reliability, and radiation hardness. Pursues efforts to further develop GaAs IC technology, non-volatile and high density memory, signal processing technology, and improved design and packaging.	FY83 efforts include: (1) Continued emphasis upon Silicon MESFET technology and linear large scale integrated circuit technology; (2) Initial development of ultra high speed Gallium Arsenide (GaAs) modulation doped FETs; Initial development of GaAs CCDs for up to 1 GHz rate transversal filters; Completion of GaAs subnanosecond memory development with demonstration of fully decoded 64 bit memory array; (3) Initial development of memory module board level work to enhance useability of magnetic bubble memories; (4) Demonstration of 16 bit, low power, radiation hard emulating computer; Fabrication of LSI chip which implements SOBEL edge extraction algorithm; and (5) Initial development of mixed mode logic arrays.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
62204/7622, All-Strike Avionics	Develops new techniques and systems for airborne radars. Efforts address development of synthetic aperture radar, automatic radar target classification, and spread spectrum ECCM investigations.	FY83 efforts include: (1) Continued analysis of target signature data and target classification algorithms from rotary platform data; (2) Completion of a concept feasibility study for utilizing adaptive agile radars in dense ECM environments; Initial tradeoff analyses to select most promising approach; (3) Initial effort to expand the SAR Test Bed to provide UHR bistatic capability; Continuation of the BTT program; and (4) Complete development of automatic SAR target classification algorithms and demonstration in the laboratory using flight test data to run algorithms in real time.
62204/7629, Fire Control Avionics	Develops new techniques for delivery of air-to-air and air-to-ground munition through integration of sensors, new fire control algorithms, and automation. Pursues efforts in counter-air technology, space based fire control concepts, sensor blending, and missile launch envelope and weapon guidance algorithms.	The following efforts will be conducted in FY83: (1) Complete Counter-Air Technology studies and identify high risk-high payoff technologies and conceptual designs for future systems; (2) Complete fabrication of EOTS; (3) Initiate development effort to provide concepts and technology requirements for a covert avionics suite; Continue development of multiple sensor blending techniques for TF/TA/OA; and (4) Provide functional requirements for a space laser fire control system to perform primary mission and self defense.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
62204/7633, Passive Electronic Countermeasures	Provides increased aerospace vehicle survivability in a hostile environment through development of passive ECM.	The following efforts will be conducted in FY83: (1) Complete fabrication of breadboard processor for staring mosaic IR warning receiver and evaluate in-house; Initiate development of breakboard IR warning receiver using staring IR focal plane array; (2) Demonstrate passive optical detection capability; Demonstrate laser warning receiver using acousto-optical fiber technology; (3) Continue investigation of methods of radar and EO cross section reduction.
62204/7662, Avionics Data Transmission and Reception	Develops improved methods for rapid, reliable transmission of information to and from aircraft.	The following efforts will be accomplished in FY83: (1) Begin development of brassboard agile bandpass filter using split electrode GaAs CCDs; Begin development of programmable transversal filter breadboard; Initiate effort to demonstrate new processing algorithms for selected CNI waveforms; (2) Continue investigation of cost effective laser communication data links and wideband modems for jam resistant/LPD data transmission; and (3) Continue operation and maintenance of the CSEL facility for test and evaluation of communication systems.

AVIONICS DEVELOPMENT PROGRAM

PROGRAM	DESCRIPTION	MILESTONES
62702/2338, Assurance Techniques for Electronics	Provides the reliablity and maintainability (R&M) technology in the form of improved electronic components reliability qualification, improved R&M testing and prediction, and demonstration techniques. Electromagnetic compatibility technology provides analysis, prediction, measurement, and suppression/control techniques.	R&M technology will concentrate on reliability assurance of microelectronic components such as microprocessors and high density memory chips (LSI&VLSI). Electomagnetic compatibility aspects of using microelectronic components will be investigated. - FY83 Device reliability efforts will address components with 60,000 gates per chip complexity. Will develop new techniques to control EMI across broad bandwidths for future communication systems. - FY84 Continue reliability evaluation and military qualification of new devices; Continue development of compatibility factors and a new prediction techniques as needed for new systems. - FY85-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
62702/4506, Surveillance Technology	Provides technology for anti-jam capabilities for tactical and space based radar by using improved antennas and signal processing technologies. Provides higher efficiency high power tubes for radars and communications. Major thrusts include ECCM, Identification and Survivability technologies.	Continued FY83 development efforts include development of integrated radar/communications using the agile beam of the tactical radar; evaluation of an operating system and software for advanced on-board signal processing array computer elements for airborne and spaceborne surveillane radars; development of fusion concepts and the application of decision aids and artificial intelligence techniques to achieve positive target ID; and RF testing of borne radar shift modules combined with membrane antenna. Planned FY84 efforts include continuation of FY83 development and testing efforts; transition of survivability techniques into the design of the Advanced Tactical Radar; Completion of evaluation of cavity coupled TWTs for use in light weight tactical transmitters; and continued development of the space communications tube. Planned FY85-88 efforts include transition of spaceborne radar technology to advanced development; transition of correlated aircraft ID techniques to advanced development; continued development of ECCM for tactical radars; and and transition of cruise missile surveillance technology into advanced development.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
62702/4519, Communications and Control Technology	Provides developments ranging from very low frequencies to optical frequencies. Current areas of emphasis include adaptive HF, fiber optics and improved satellite techniques.	FY83 efforts include continued development of standard fiber optics components; transition of adaptive HF components to advanced development; completion of cost reduction designs for satellite communications terminals; and development of an adaptive EHF processor module and a flexible digital modem for satellite communications. Planned FY84 efforts include transition of fiber optic transceiver work to advanced development; continued work on fiber optic wavelength division multiplexer; initial work on a fiber optic bus; continued HF work; and continued work on a low cost satellite communication terminal. FY85-88 plans include completion of previous development efforts and transfer to advanced devement.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
62702/4594, Intelligence Technology	Develops improved techniques for signal processing, imagery exploitation, non-numeric data processing and advanced targeting and charting.	FY83 efforts include high speed, high density optical disk recorder development; exploitation of advanced sensor imagery; non-numeric data processing; transition of target location technology to advanced development; and data production improvements for Defense Mapping Agency. FY84-88 efforts include continued developments to improve signals and communications intelligence processing methods, data transfer and storage methods, digital targeting techniques, high speed data handling and intelligence exploitation. These development efforts will transition to further development and operational use throughout the FY84-88 period.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
62702/4600, Electromagnetic Radiation, Devices and Components	Provides technology for radar signal processing using analog correlators, filters, delay lines, etc., made of surface accoustic wave (SAW) and charge coupled devices (CCD). Provides data on maximum efficient propagation paths for communications and surveillance systems. Develops components for fiber optics systems, including high strength radiation hard cabling. Provides improved materials for electromagnetic devices such as quartz and indium phosphide for clocks.	FY83 efforts include multi-frequency, microstrip antennas; programmable signal integration using SAWs and CCDs; microprocessor radiation hardening; testing of a new mode for HF ionospheric ducting; and initial develop of a hybrid optical signal processor to decode long pseudo-noise codes and preclude large quantities of digital processors. Planned FY84 efforts include continued radiation hardening of electronic devices; continued development of improved low cost, light weight RF replacement components; and continued development of improved electronic device materials. Planned FY85-88 development efforts include improved CCD and SAW signal processing, improved electromagnetic device materials, and transition of earlier efforts to advanced development. A new program for advanced development of promising timing and synch technologies will begin.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
62702/5581, Information Sciences Technology	Provides automated tools for both software managers and designers, mathematically vigorous validation techniques for large programs, automated computer code generation tools, techniques for reuse of proven software, and simplifed use of higher order computer languages. Provides machine intelligence technology to aid the decision makers at different command authority levels.	FY83 efforts include methodology for software maintenance; a thrust to meet unique Air Force computer technology needs through the year 2000; completion of a microprocessor handbook; and decision aids system technology with concentration on automating some functions in current command and control systems. FY84 efforts include continued development of an automated system to collect quality data on software systems; application of artifical intelligence techniques to the maintenance of the Ada language; and investigation of advanced techniques to size software development efforts and estimate software development costs. Planned FY85-88 efforts include transition of various technologies to advanced development, development of higher order language tools for auotmated programming, and development of a more natural software language.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63103, Advanced Airborne Radar Development	Develops bistatic radar and reference system technologies to provide passive (Covert) radar concepts. The objective is increased survivability of recon and weapon delivery aircraft via covert avionics for penetration, acquisition and screening of multiple, mobile and other high value targets.	Key Technology Flight Demonstrations - FY87-88 Covert Strike Concept Demonstration - FY92
63106/2940, Computer Technology for Systems Design& Maintenance	Develops new technologies to improve the logistics process and weapon system reliability and maintainability, and new technologies to improve maintenance and support of systems while reducing requirements for high skill personnel. Projects will concern maintenance and logistics factors in computer aided design (CAD) and an integrated maintenance information system that incorporates technologies for improving maintenance diagnostics. This is an FY84 new start.	Determine maintenance and logistics factors suited for CAD - 4 Qtr 84 Develop CAD Computer models - 3 Qtr 85 Integrate Maintenance Information Systems Analysis - 4 Qtr 85 Develop CAD/CAM data bases - 1 Qtr 86 Define Artifical Intelligence requirements - 1 Qtr 86 Test CAD systems - 4 Qtr 86 Prototype Integrated Maintenance Information System Test - 4 Qtr 87 Complete integrated maintenance information system - 4 Qtr 88
63203/666A, Advanced Reference Systems Technology	Provides development for improved accuracy reference subsystems for sensor stabilization/weapon delivery; high antijam capability for externally referenced systems; lower acquisition and support costs; and improved reliability. Current development efforts include an Integrated Inertial Reference Assembly (IIRA), high accuracy Ring Laser Gyro (RLG) and an Adaptive Multifunction Antenna (AMA).	Complete AMA Breadboard Demonstration -1 Qtr FY84 Complete IIRA Design - 2 Qtr FY83 RLG Brassboard Complete - 2 Qtr FY85

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63203/69CK, Advanced Devices	Provides development for improved avionics devices including microwave/laser power sources for EW and weapon delivery and electronic/optical processing components for extremely high speed signal processing. Major objectives include improved performance; reduced size, weight and power consumption; and reduced life cycle costs. Current areas of emphasis include magnetic bubble memory, laser sources, microwave and millimeter wave sources and solid state phased array radars.	Complete Silicon Nitride Radome Demonstration - 2 Qtr FY83 Complete GaAs IMPATT Power Combiner Demonstration - 3 Qtr FY83 Complete X-Band Radar Coupled Cavity TWT Demonstration - 4 Qtr FY84 High Power UHF Solid State Source Demonstration - 3 Qtr FY85 Complete Solid State Phased Array Radar Design - 4 Qtr FY83
63203/69DF, Advanced Weapon Delivery	Provides development for fire control systems for multiple kills/pass, IR threat sensor systems, FLIR optimized for automatic target recognizer applications and increased AMRAAM launch envelope.	Complete IRST Flight Test/Transition - 3 Qtr FY85 AMRAAM MLE Transition - 1 Qtr FY84 Transition IFFC (FIREFLY) - 1 Qtr FY83 Advanced Target Acquistion Sensor (ATAS) Flight Test Complete - 4 Qtr FY85 All weather Maveuvering Attack Algorithms (MACE) Simulation Complete - 2 Qtr FY86

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63203/2733, Advanced Reconnaissance Radar	Provides for radar development efforts which include slow ground moving target indication/location (GMTI/L), low probability of intercept (LPI) terrain following (TF) radar, radar aided mission/aircrew capability evaluation (RAM/ACE) and monostatic integrated radar demonstration.	LPI TF Flight Test Complete - 2 Qtr FY84 SGMTI/L Independent Assessment Complete - 4 Qtr FY83 Solid State Phased Array Flight Test Complete - 4 Qtr FY86 Monostatic Integrated Radar Demonstration Complete - 4 Qtr FY87 RAM/ACE Simulation Complete - 4 Qtr -FY83
63205/2506, Control of Flight	Develops promising technologies for fighter aircraft offering large improvements in capability and survivability over current systems. Current efforts include development of the Digital Flight Control System (DFCS) and Automated Maneuvering Attack System (AMAS) for the Advanced Fighter Technology Integration (AFIT/F-16 test vehicle); a share of the Integrated Inertial Reference Assembly (IIRA) being jointly funded with 63203/666A and STOL Fighter Technology.	AMAS Flight Test Complete - 3 Qtr FY85 IIRA PDR - 1 Qtr FY84 IIRA Flight Test - FY88 STOL Fighter Technology Flight Test Complete - 4 Qtr FY88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63208/665A, Reconnaissance Sensors/Processing Technology	Provides development for single seat auto targeting capabilitiy, acquisition and location of multiple targets per pass and detection and tracking of tactical targets in adverse weather conditions. Current efforts include a FLIR optimized for auto target recognition, a target recognizer that locates and classifies targets, and a CO_2 strike sensor with TF/TA/OA and weapon guidance.	Second generation FLIR DT&E - FY83-85 FLIR Automatic Target Recognizer Concept/Design Complete - 2 Qtr FY84 Automatic Laser Target Classification - FY84-86 CO_2 Sensor Flight Test/Data Collection - FY84-85 Advanced CO_2 Laser Radar Sensor FY86-89 Camouflage & Foliage Penetration Radar Design Complete - 2 Qtr FY85 Automatic Ground Target Exploitation Transition - 1 Qtr FY85
63211/2100, Laser Hardening Materials	Provides for development, evaluation, and demonstration of laser hardened materials for all critical systems components to counter the laser threat. Applies to satellites and aircraft systems.	Transition Hardening Technologies for a varitey of applications - FY85-89

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63226, DOD Common Language	This program is part of the DOD effort to implement, introduce and provide life-cycle support for Ada, the DOD common, high-order programming lanuguage for embedded computers. It will provide for resources to meet language support requirements which are common to the services and agencies including development of an Ada Programming Support Environment (APSE), Ada compiler validation capability and software support tools.	Ada Compiler Validation Capability Completed - Sep 82 American National Standards Institute (ANSI) Standard Established - Jan 83 Ada Compiler Validated - Mar 83 Initial Ada Programming Support Environment Available - Dec 83 Ada Video Tape Course Available - Jul 84 Definition of Life - Cycle Methodology Tools Completed Jan 85
63230/2472, Advanced Tactical Fighter	Provides concept exploration and demonstration/validation activity for the next generation tactical fighter; addresses air-to-air and air-to-surface needs; investigates feasibility of multimission aircraft. Program results in a concept and preliminary aircraft design suitable for transition to FSED in FY87.	Milestone 0 - Oct 82 Milestone I - Sep 84 Milestone II - FY87 Milestone III - FY90
63239, Advanced Tactical Air Reconnaissance System (ATARS)	Investigates alternative solutions to meeting the needs specified through multiple study efforts and prototyping of promising alternative systems. Provides for assessment of current system deficiences to determine whether traditional collection methods or variations thereof are valid alternatives for the 1990's. This program is an FY83 new start.	Requirements studies, concept definition efforts evaluation of concepts and recommendations for further development - FY83-84 Demonstration of key technologies and concepts and prototype fabrication - FY85-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63244/2251, Joint Technical Coordinating Group for Aircraft Survivability (JTCG/AS)	Provides survivability and vulnerability assessment methodology; design criteria specifications and related documentation for hardening and survivability and vulnerability technology efforts. Supports the Air Force portion of the JTCG/AS interservice program. Efforts are being conducted in the areas of radar-cross-section and IR signature reduction; data base development and information exchange; survivability modeling; human factors; and threat assessments. Fundings will be incorporated into design trade-off models, design handbooks and military specifications and standards.	Several projects and related milestones extend from the current period through FY89.
63245/2061, Advanced Fighter Technology Integration (AFTI)	Provides integration and flight test for technologies developed under P.E. 63205/2506, Control of Flight. Efforts include use of the F-16 AFTI test vehicle to demonstrate technologies which provide improved survivability and combat effectiveness.	Complete AFTI/F-16 Digital Flight Control System (DFCS) Evaluation - 3 Qtr FY83 Automated Maneuvering Attack System (AMAS) Flight Test - 2 Qtr FY84-3 Qtr FY85

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63248, Concept Development	Provides funding support to expedite the transition of new concepts through preliminary design and demonstration. Supports timely response to deficiencies identified in on-going planning processes. This is an FY 84 new start which has potential application across all areas including avionics. Assessment of existing P.E.s/reprogramming will be used to promulgate new concepts in FY83.	
63249/2882, Target Recognizer Technology for LANTIRN	Provides for a competitive advanced development effort in support of a preplanned product improvement (P^3I) program for LANTIRN. The target recognizer is a high speed video processor, which will select most probable targets in the FLIR display generated by the LANTIRN targeting pod.	Competitive Development Efforts - FY83-84 Flight Test Demonstration - 2 Qtr - FY85 Transition to FSED - FY85 Production Decision - FY87
63250, Lincolon Laboratory	Provides high technology R&D primarily in advanced electronics through the provisions of a cost reimbursement contract with the Massachusetts Institute of Technology. The advanced electronics program is structured to advance the state of the art in solid state and digital integrated circuits. Technology advances are being applied to the areas of satellite communications, tactical technology and space surveillance.	

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63253/2538, Integrated Communications Navigation Identification Avionics (ICNIA)	Provides development and fabrication of competing designs for an integrated system to perform all voice and data functions in the 2-2000 MHZ spectrum. Planned areas of improvement include jam resistance; precision navigation; reduced size, weight, and life cycle cost; reduced pilot workload; and improved survivability, availability, and maintainability.	System Concepts/Definitions Complete - 2 Qtr FY83 Lab Breadboard Demonstrations Complete - 4 Qtr FY84 Independent Design Analysis Activities - 4 Qtr FY83-FY86 Independent Software Verification - 4 Qtr FY83-FY88 Specifications & Document Development - FY84-86
63253/2734, Advanced System Avionics (ASA)	Provides for development of advanced system avionics technologies including advanced archtectures and associated system elements; evaluation of potential system standards; and assessment of information integration opportunities/benefits (e.g. availability, automation and suvivability). Efforts include development of high technology elements required to demonstrate advanced architectures (e.g. software, multiplex, controls/displays and processors); and laboratory integration, test and validation of new mission capabilities. Major benefits include improved survivability, reduced pilot workload and increased availability.	System Definition Complete - 3 Qtr FY84 System Design/Development Complete - 3 Qtr FY85 Mission and Design Analysis Activity - FY82-86 Subsystem Development Activities - FY82-87

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63253/2735, Integrated Flight Demonstrator (IFD)	Provides for flight validation/maturation of technologies developed under 63253/2538 (ICNIA) and 63253/2734 (ASA); and flight validation of 6.3 and 6.4 sensors and subsystems. Efforts include installation of ASA developed core architecture incremental addition of sensors/subsystem and use of modified ASA test bed for debug support. Major benefits include risk reduction, early application of technology for SPOs and cost savings.	System Definition - FY83 Advanced Technology Architecture Integration - 3 Qtr FY83 - 4 Qtr FY85 System Design/Development - FY86-88
63431/1227, Terminal Sement Technology	This project evaluates space communications system airborne terminal requirements and develops concepts to meet those needs; evaluates technology available to implement the concepts; determines and conducts required additional technology developments; conducts simulation and concept evaluation efforts; and assists in evolutionary improvement in operational systems. Current efforts include upgrade of the AN/ASC-30 Airborne Command Post Terminal, Advanced Airborne Terminal and Solid State Amplifier developments.	Airborne Command Post Terminal Testing Complete - Sep 83 Airborne Command Post Terminal Technology Transfer to MILSTAR - FY83 AN/ASC-30 Airborne Terminal Upgrade - FY84 Begin Testing ASC-30 Upgrade - Sep 85 Complete 44 GHZ Solid State Amplifier Development - FY84

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63431/2029, System Analysis/Demonstration	Accomplishes analyses of DOD MILSATCOM developments, postulates MILSATCOM architecture impacts, investigates alternative system configurations, and identifies technologies for development.	MILSTAR Concept Definition Studies - FY83 DSCS III U Hardware Development - FY82-84 Technology Roadmap and Master Planning Activities - Continuing
63452, Very High Speed Integrated Circuits (VHSIC)	Provides for development of a new generation of integrated circuits with 50-100X the function throughput rate and 1/10 the size, weight, power, failure rate and life cycle cost of equipment with existing integrated circuits. Major benefits include increased system reliability; increased performance, and reduced size, weight, power, failure rate and life cycle cost. Major areas of application include EO, radar, EW, guidance, communications, and acoustic signal processors.	Phase I (Deliver 1.25um Chips & Brassboards) Completed - May 84 Phase II (Deliver .5 - .7um Chips & Brassboard) Complete - May 86 Phase III (Lithography, Materials, Packaging, Standards) Transition/ Availability - FY84-86
63718/691X, Electronic Warfare Technology	Provides for development and demonstration of RF countermeasures. Efforts include analysis of penetration and survival requirements; development of countermeasures techniques and associated technology; development of brassboard systems for demonstration and evaluation; and demonstration of worth via simulation and flight test against threat systems or threat replicas. Technical areas being addressed include monopulse countermeasures, high power jamming, advanced transmitter systems, low observables, ECM compatible with reduced signature, fuse jamming and emitter signal processing and tracking. Primary aircraft applications include B-1B, EF-111A, ATF, F-15 and F-16.	

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63718/2432, Warning and Power Management Systems Technology	Develops and demonstrates military potential of EW system architectures to identify, prioritize, and generate jamming strategies for complex radar environments. Efforts include analysis of projected threat environments; development of techniques to handle large numbers of emitters including agile types; development of brass-board systems for demonstration of threat warning and power management; simulation and flight test activity; and advanced development of the New Threat Warning System (NTWS). Planned applications for advanced power management technology include EF-111A, B-1B and ATF. NTWS will be used in all advanced aircraft.	
63718/2754, C^3 Countermeasures Technology	Develops and demonstrates RF Countermeasures against C^3 systems to enhance penetration and survival capability. Efforts include requirements analysis; development of countermeasures techniques for airborne jamming and deception; development of ECM for drones and expendables; development of real-time target recognition and ground based deception capability; development of brassboard systems; and simulation and flight test demonstrations. Planned applications include COMPASS CALL and B-1B.	

AVIONICS

PROGRAM	DESCRIPTION	MILESTONES
63726, Fiber Optics Development	Provides for the development of fiber optic systems needed to meet Air Force operational requirements for lightweight, low cost, broad band transmission systems. Effort includes development of standards to provide interoperability between Air Force systems and the systems of other services to prevent the proliferation of non-standard equipments. This is a FY83 new start.	Initial planning for the 26-pair cable replacement program, (Army funded); advanced development on standard transceiver family and single fiber optical communiaitons system - FY83 Development of fiber optics standards, transmission systems, and continuation of the 26-pair cable replacement program - FY84 Complete development of cable replacement and multipurpose transceiver family; Begin development of a bus transceiver family, optical multiplexers and radio frequency remoting - FY85-88
63727/2345, Jam Resistant Data Link Technology		
63727/2746, Low Probability of Intercept (LPI) Communications Technology		Initial planning, analysis and scoping of the difficulties of current communication system (such as network timing, key distribution) and analyze the parameters of the late 1990s commuications threat. - FY83 Initiate a competitive concept definition effort to define possible technological solutions to the antijam and LPI communication requirements. - FY84 On-going concept definition efforts; Initial subsystem development and fabrication. - FY85-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63727/2747, Communication Vulnerability Analysis		
63727/2748, Advanced High Frequency	Provides planning and development for anti-jam wideband HF communications. This capability will serve as an alternative to satellite communications for voice and data capability in jamming and nuclear environments.	Develop narrowband HF modules compatible with HF effort being conducted under 33131/2833 - FY82-86 (Efforts include voice source encoding over narrowband HF channels, adaptive channel equalization, adaptive signal processing and frequency hopping) Develop adaptive null steering antenna and frequency management/power control modules - FY85-88
63728/2527, Software Life Cycle Costs	Develops technology to transform user requirements into precise software specifications. Provides methodology to exploit this technology and to allow managers to more effectively control and evaluate software development.	Continue work to develop a software test handbook and to specify software quality attributes. - FY83-84 Develop and demonstrate a software requirements specification tool for Air Force C^2 acquisitions. - FY84-85 Modify tools and methodology to expand their utility beyond C^2 programs. - FY85-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63728/2529, Computer Architecture Applications	This project evaluates state-of-the-art commercially developed computer architectures for potential military applications. In concert with the Army, this project will adapt the 32-bit Nebula Instruction Set Architecture (ISA) for Air Force C^2 applications.	Complete development of a general purpose computer hardware descriptions language - FY83 Define Air Force requirements in C^3I for a 32-bit architecture. Begin development of a hardware design based on Nebula to satisfy these requirements. - FY84 Complete hardware design and begin development of the operating system and support software to allow implementation of the Nebula based ISA. - FY85-88
63728/2530, Distributed System Technology	Develops tools, techniques and the necessary simulation capability to analyze, specify and evaluate distributed computer systems. Emphasis is on tactical distributed data base operating systems and processing resources.	Continue development of a Distributed Operating System (DOS) to control the interactions of computers interconnected through local data buses as a forerunner to a full DOS simulation capability - FY83 Develop buss coupled DOS software to support an adaptive command and control interface system. Develop software required to operate a dispersed network under centralized control. - FY84 Develop and demonstrate validation and certification techniques for distributed system survivability and fault tolerance, and demonstrate these on appropriate systems. Demonstrate concepts such as C^2 status monitors, network access controls and data base sharing in a tactical environment. - FY85-88

AVIONICS DEVELOPMENT PROGRAM

PROGRAM	DESCRIPTION	MILESTONES
63728/2532, High Order Language (HOL) Discipline	Provides program support tools and compiler implementation for the DOD Standard High Order Language, Ada.	Complete JOVIAL Compiler Implementation Tool (JOCIT) effort; Begin Ada compiler programming environment and support tool development - FY82-83 Continue development of Ada root compiler and begin compiler retarget to selected Air Force computer systems. Accelerate development of the Ada integrated programming support tool package. - FY84 Complete Ada compiler integrated programming environment development and validation. Begin study of very high language for application to Air Force C^2 system development - FY85-88
63735/2188, Air Force World Wide Military Command and Control System (AFWWMCCS) Systems Engineering Planning and Support	This is a systems engineering effort consisting of analysis, simulation, and prototype and modification development to resolve interoperability and intersystem deficiencies of current Air Force Command, Control, and Communications (C^3) Systems. Numerous tasks are performed with the overall objective of assuring that C^3 systems conform to the WWMCCS architecture and to assure that the total WWMCCS configuration is balanced in terms of capability, survivability and cost.	Accomplish intersystem engineering tasks including tactical warning/attack assessment; strategic forces C^3; MAC C^2 support; and Command Center Processing and Display Systems (CCPDS) - FY81-88 Accomplish selected architecture tasks including: - Joint Crisis Management Capability (JCMC) Program Hatch Cover Modification - FY83-86 - Jam-Resistant Secure Communications (JRSC) Program IOC - FY84

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63742/1177, Non-Cooperative Identification Techniques		Initial Design for Integrated Identification -1982 Passive RF Identification Sensor Design/Simulation - 1983 Complete Engineering Simulation and Development of Performance Specifications for RWR/Fire Control Interface Software (RFIS) - 1984 Complete Airframe Identification Algorithm Development - 1985 Complete Advance Development of Multiple Sensor Integration Algorithm -1986
63742/2599, Cooperative Identification Technology	Provides advanced development in support of U.S. obligations under a multinational cooperative R&D program. Products transition to 64725/2598 for engineering development.	NATO Standardization Agreement (STANAG) - 1982 DSARC I - 1983 STANAG Ratified - 1986 DSARC II - 1986 DSARC III - 1989

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63743/43IG, Electro-optical Warfare	Provides for advanced development of airborne IR and laser signature control, warning, and countermeasures. Effort includes design development, fabrication, assembly and test of expendables, IRCM jammers, laser and missile warning systems, and non-RF stealth technology. Related IR&D: Hughes Aircraft Co., #81-091, VHSIC Signal Processing for EO Systems.	
63743/2222, Advanced Electro-Optical	Provides for advanced development of airborne EOCM systems. Includes design, development, fabrication, assembly and test of EOCM systems and critical commponents. Related IR&D: Hughes Aircraft Co., #81-091, VHSIC Signal Processing for EO Systems	
63747, PAVE MOVER	Provides for development of the PAVE MOVER airborne advanced technology radar system. PAVE MOVER incorporates synthetic aperture and moving target indicator techniques to detect moving targets from stand-off ranges and to direct accurate attack. PAVE MOVER directs accurate attack by cue-vectoring attack aircraft and by providing guidance data to a stand-off missile. This program contributes to the OSD-directed Army, Air Force Joint Surveillance and Target Attack Radar System (JSTARS) program.	Compete Assault Breaker Demonstrations - Sep 82 Complete Radar Characterzation/Evaluation at White Sands - Mar 83 Initiate Development of ECCM/Target Discrimination Features - FY83 Transition Advanced Technology into FSED Program (64616) - FY84-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
63749, C^3 CM Advanced Development	Provides for advanced development and planning for C^3 countermeasures activties immediately prior to full scale development. Efforts include long range planning and architectural development for both tactical and strategic applications; investigations to develop new C^3CM systems and to improve fielded C^3CM systems; studies of future C^3 CM possibilities; and other C^3CM activities deemed necessary. This is an FY84 new start.	
63750/2334, Airborne Radar Electronic Counter-Counter-measures (ECCM)	Provides for development of airborne radar ECCM technologies/concepts. Efforts include evaluation of the effects of ECM on modern pulse doppler radars; identification of technical areas with the highest pay-off; and development and flight demonstration of high pay-off techniques/concepts.	Complete air-to-air ECCM technology base-line program - FY83 Radar spread spectrum laboratory demonstr-ation - FY86
63750/2347, Optical Counter-Countermeasures	Provides for development of electro-optical CCM technologies/concepts. Efforts include evaluation of the effects of EOCM/decoys upon electro-optical systems; identification of techni-cal areas with highest pay-off; and development and flight demonstration of high pay-off techniques/concepts.	CM hardened FLIR demonstration - FY86 Complete Combined Sensors for Targeting, Acquisition, Recognition and Strike (COSTARS) Program - FY86
63789/2478 Tactical C^3I Architecture	Provides for development of road maps, activity sequences, schedules, and cost estimates for tactical C^3I systems and equipments.	Expand European Theater Tactical C^3I Architecture to include components outside the NATO central region - FY82-83 Extend architecture to PACAF and plan PACAF implementation - FY84

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64201/2257, Standard Avionics	This project supports the evaluation, identification, and initial development of subsytems, specifications and standards for multiple aircraft application and other related efforts in support of avionics standardization. It also supports on-going planning activities such as the Avionics Master Plan and open forum activities. Open forum activities include the Air Standardization Coordinating Committe (ASCC), the Airline Electrical Engineering Committee (AEEC), NATO working groups and the Annual Armament and Avionics Planning Conference. Other activities within this project include the development and on-going support for the Avionics Data Utilization System (ADUS). ADUS produces several avionics related reports on demand in addition to the annual Avionics Planning Baseline document.	FY83 - Investigate feasibility of a standard flight data recorder, a standard digital intercom for retrofit applications and a standard algorithm for radar warning receivers. FY83-88 - On-Going planning, open forum, standardization and ADUS support activities.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64201/2297 Airborne Computer Software Standardization	This project supports the identification of airborne computers and avionics related software support products to be developed and/or designated as Air Force standard items.	Complete design of microcomputer implementation of MIL-STD-1750A; Complete acceptance test procedure including benchmark test programs (software) for MIL-STD-1750A; Investigate feasibility of hosting a MIL-STD-1589 (J-73) HOL Compiler on an existing microcomputer (VAX); Investigate impact of using standard HOLs for microprocessors and microcomputers embedded in avionics systems and subsystems - FY82-83 On-Going activities including maintenance of compilers and other software support tools for multiple program offices; continued support of avionics computer and software standardization initiatives - FY83-88
64201/2519, Radar Programmable Signal Processor (RPSP)	This project provides improved radar performance through use of common software and architecture. Applications include the F-15, F-16, and B-1B. Emphasis is placed on development of air-to-air and air-to-ground modes that can be applied to to these aircraft with minimun duplication of effort.	Develop improvements in TF/TA, ECCM, reliability and maintainability; Develop standard architectures for the F-15, F-16 and B-1B; Analyze SAR mapping capabilities and electronically scanned antenna technology for increased radar performance and standardizations. - FY82-83 Continue introduction and development of radar modes and capabilities with emphasis on ECCM and reliability and maintainability. - FY84. Continue cooperative F-15, F-16 and B-1B radar development and test activities. - FY85-86

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONE
64201/2560, (JOVIAL) Language Control Facility (LCF)	The LCF is a service organization for control and maintenance of standard language definitions and standard compilers, compiler testing, and technical language guidance to users during the software acquisition cycle. LCF operates under the direction of the language control agent (LCA) responsible for avionics HOL policy implementation.	On-going LCF support for DOD users of JOVIAL - FY83-84 LCF transition of standard software support tools to user. - FY85-88
64201/2658, Integrated Digital Avionics (IDA)	Develops mid-to-far term standard architecture (based on the DAIS concept) and assists program managers in application of these standards to future programs. Effort includes maintaining baseline standards and development of extensions or modifications of existing standards to keep abreast of technological evolution. Provides capability to certify that new avionics meet the requirements of the applicable standards.	Continue work on certification tools for MIL-STD-1750A including efforts to make the tools portable and increasing the automation of the testing procedures - FY83 Begin development of a MI-STD-1760 certification capability; Test new avionics subsytems to certify that they meet the baseline architectural standards; Develop new standards and fund validation of those standards; Support open forum processes; Monitor P.E. 63253 to assure laboratory draft specifications and standards are compatable with the IDA baseline - FY84 Continue previously established support and validation activities; Develop certification capability for new laboratory developed standards from P.E. 63253 FY85-88
64201/2771, Standard Air Data Computer	This project is a joint Air Force/Navy program to develop a new Standard Air Data Computer primarily for the retrofit market. Air Force applications include C-141, KC-135, F-111, F-4 and C-5. Navy applications include A-7, A-4, A-6, C-2, E-2, EA-6, KA-6 and TA-7.	Complete ground and flight tests; Award production contract for C-5 - FY83 Inital production deliveries - FY84 Testing and follow-on contracts for other aircraft retrofit programs - FY85-88

ANNEX B

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64212/4366, Integrated Attack Avionics	Project previously developed a charge coupled device camera for use in TAF aircraft. Current efforts include aircraft to camera interface design to develop a compact airborne video recorder, a split screen video compression capability and a color cockpit video sensor.	Current efforts described are projected through the FY83-88 period.
64220/2066, EF-111A Development	This development effort provides minimum/basic updates to the EF-111A ALQ-99E jamming subsystem.	Antenna pattern improvement and radar absorption studies - FY82-83 Begin studies to improve ALQ-99E jamming, self-protection and terminal threat warning subsystems capabilities - FY84 On-Going software updates to the ALQ-99E- FY83-88
64220/2687, EF-111A Operational Flight Trainer	Provides development of a two place simulator to facilitate realistic EF-111 mission training.	Contract award - Jul 1982 Preliminary Design Review - 2Qtr FY83 Critical Design Review - 1st Qtr FY84 In-Plant Testing - FY85 Prototype ready for training - 2nd Qtr FY86 Production Unit ready for training - 2nd Qtr FY87
64226, B-1B	Provides development and test for the B-1B bomber program.	Initial Contract Award - Jan 82 Configuration Review - Jan 83 Initial Flight Test - Apr 83 IOC - Sep 86 FOC - Jun 88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64233, Tanker Transport Bomber (TTB)	The TTB will enable Air Training Command to implement Specialized Undergraduate Pilot Training (SUPT) for students selected for operational assignment to tanker, transport or bomber aircraft. The TTB will be an off-shelf twin engine business jet, which will utilize standard preferred avionics items to the extent practical. Training provided with a TTB aircraft should improve the quality of pilot graduates; reduce the time and cost for operational aircraft checkout and extend the T-38 fleet sufficiency from the late 1980s to beyond the year 2000. This is a FY 84 new start.	RFP Release - Oct 83 Contract Award - Mar 84 Initial Production Deliveries - FY86 IOC (36 Aircraft) - FY88
64235, Advanced Vertical Lift Development (JVX)	Provides for Air Force participation in an OSD directed program to develop an advanced technology vertical lift aircraft for multi-service use. Air Force applications will include combat rescue and special operations. This is a FY83 new start.	RFP Release - Oct 22 Begin Program Definition Phase - Jan 83 Contract Award (Competitive Phase I) - Apr 84 Begin FSD for selected Airframe & Engines (Phase II) - FY85 IOC -FY93
64247, Modular Automatic Test Equipment (MATE)	Provides for development of MATE specifications, standards, guidebooks, programming aids, software validation and verificaiton tools and a family of standard ATE hardware and software modules. Current planned applications include A-10, LANTIRN and replacement depot ATE for F-4, F-15, F-111, C-141, and F-16 aircraft.	MATE engineering development efforts including validation and maturing of MATE guidebooks during A-10 INS and LANTIRN HUD ATE development; Replacement depot level ATE for F-4, F-15, F-111, C-141 and F-16 aircraft. - FY82-85 Equipment deliveries including A-10 and Depot ATE; and delivery of MATE support center for use in software maintenance and qualification of MATE hardware and software modules. - FY83-85

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64249, Night Attack Program (LANTIRN)	Provides for development of the Low Altitude Navigation and Infrared System for Night (LANTIRN). The LANTIRN pod being developed is an air-to-ground electro-optical fire computer processing. The system will provide single seat, low altitude target acquisition, recognition and weapons release in night/limited adverse weather operations.	Critical Design Reviews Completed - Apr 82 F-16 Hud Flight Test - Jul 82 - Nov 82 HUD Production Decision - Dec 82 Initial Pod Flight Test - Jul 83 Production Contract Award - Feb 85
64313, T-46A Next Generation Trainer (NGT)	Provides for development and test of the replacement aircraft for the aging T-37 fleet. Off-the-shelf equipment (including avionics) will be used where possible.	FSD Start - 4Q FY82 PDR - 2Q FY83 Inital Flight Test - 2Q FY85 AFSARC III - 4Q FY86 IOC - 4Q FY87
64616/2814, PAVE MOVER Radar/Fire Control System	Develops Joint Surveillance and Target Attack Radar System (JSTARS) airborne radar, signal processors, controls and displays required for a core capability of wide-area MTI surveillance.	See milestones under 64616/2727 PAVE MOVER Interfaces.
64616/2727, PAVE MOVER Interfaces	Develops architecture, interfaces, hardware, and protocols and software required for interoperable sharing of Joint Surveillance and Target Attack Radar System (JSTARS) data by a number of users.	PAVE MOVER Radar Demonstrations; FSD for JSTARS based on earlier PAVE MOVER work; Continued Inter-operability Studies; Initial Electronic Suite repackaging and installation in OV-1 and TR-1; Data link selection - FY83 Continued JSTARS FSD work; Preparation for installation and test on OV-1 and TR-1; platforms; Initial production planning - FY84 Tranfer of 63747, PAVE MOVER enhancements to JSTARS; Continue JSTARS FSED; Begin production - FY35-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64710/1155, Electro-Optical Collection Reconnaissance (COMPASS SEVEN)		
64710/2337, Advanced Reconnaissance Sensor (ADRES)	This project will develop an Advanced Reconnaissance Sensor (ADRES) as a follow-on effort to a sensor which has completed advanced development under PE 63208. Planned applications include fighter, reconnaissance and bomber aircraft. The ADRES will employ a modular unit construction capable of interfacing with different types of aircraft, soft copy exploitation and on board processing techniques.	IR Digital Data Base Contract Award - Mar 82 Initiate ADRES Definition Studies - Aug 83 ADRES Prototype Development - FY85-88
64710/2501, Electronic Warfare Support Measures (EWSM)	Provides for development of a passive EWSM suite that will identify and locate hostile emitters in the 1990 period. Funding is being withheld until the program is transferred to the Tactical Crypotological Program (TCP) in FY84.	
64710/2660, AAX-X Infrared Sensor	This project develops a second generation IR sensor based on AF and Army advanced development efforts in IR focal plane array technology. Applications include advanced reconnaissance and tactical aircraft.	Funds have been cut through the period FY82-84. Initiate System Definition Studies - Jul 85 Initiate Engineering Development Aug 86
64710/2[illegible]4, Tactical Electronic Reconnaissance (TEREC)	Provides for software updates and other on-going changes to the TEREC system previously developed within	Start Development of HF Data Link Encryption - Jun 82 HF Data Link Exception DT&E/IOT&E - Mar 84 Second TEREC Remote Terminal (TRT) Production Contract - May 84 Initiate Exotic Threat Update - Feb 85

AVIONICS DEVLOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64710/2749, All Weather Target Classification Sensor	Develops an airborne sensor system consisting of a cueing sensor, high resolution all weather sensor and integrated processing for automatic detection, location, and classification of targets.	Initiate Definition studies - Oct 85 Initiate Engineering development - Oct 86
64711/2485, Survivability/ Vulnerability (S/V) of C^3 Systems	Develops and evaluates the basic techniques to assess and harden critical C^3 systems. Determines through analysis and testing the S/V of DOD C^3 systems/subsystems to nuclear effects.	Complete development of a high altitude radiation detection system; Develop fiber optics hardening technology; Validate EMP hardness of DSCS ground terminals - FY82-83 Conducts system propagation analyses and C^3 vulnerability studies; Continue fiber optics hardening technology development - FY84 Continue FY84 activities; Develop an EMP data base for C^3, aircraft and missiles - FY85-88
64711/3763, Survivability/Vulnerability (S/V) Assessment of Aerospace Systems	Provides for development and evaluation of basic techniques to assess and harden aerospace systems. Determines through analysis and testing the S/V of systems and subsystems to nuclear effects. Supports the FB-111, B-52, EC-135, E-4B, ALCM, and B-1B in hardening against Electromagnetic Pulse (EMP) effects and in assessing EMP survivability	Support B-52 OAS/CMC EMP assessment; Develop a combined EMC/EMI/EMP/ lightning standard; Procure an EMP testbed to support development of advanced EMP hardening techniques - FY82-83 Continue efforts begun in FY83; Initiate a major effort to develop advanced EMP hardening techniques; Support the DNA/Multi-Agency Cooperative EMP Hardening Technology Program - FY84 Continue efforts initiated in FY84 - FY85-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64724/2462, COMPASS CALL Development	Provides for development of baseline COMPASS CALL systems/subsystems and on-going improvements to the baseline.	
64724/2677, C^3 Countermeasures Development	Provides for development of C^3 Countermeasures.	
64724/2726, Electromagnetic Combat Support	Provides for development of ground-based electronic combat support units; Funds the data base management and planning architecture required to establish the best combination of C^3 targets and the techniques most effectives against those targets.	Complete definition and begin development of ground-based systems; Continue development of C^3 Countermeasures support data base - FY82-83 Continue development of ground-based systems and training systems - FY84-88
64725/2463, Mark XII Identification Friend or Foe (IFF) Technical Improvement Program (TIP)	Provides for development of Mark XII IFF improvements.	Update Mark XII threat assessment/vulnerability analysis; Identify near term versus mid/far term improvements; Conduct some additional DT&E/IOT&E testing to validate near term improvements - FY82-83 Initiate development of software modifications for the F-16 AIS as needed to support improvements to the APX-101 transponder - FY84 Complete development activities in support of Mark XII improvements - FY85

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESOTNES
64725/2597, Non-cooperative Identification Subsystems	Provides for engineering development and test of techniques demonstrated under 63742/1177.	Indirect Identification Demo Planning - 1982 F-15 DMR Flight Test - 1982 RF Seeker Pod Demo -1982 F-16 DMR Integration -1984 F-15 DMR Integration - 1985 Multiple Sensor Integration Development - 1986 Passive RF Identification Development - 1987
64725/2598, Cooperative Identification Systems	Provides for studies, analyses, development and test efforts leading to a NATO interoperable cooperative identification system (MARK VX).	DSARC I - 1983 STANAG Ratification - 1985 - 1986 DSARC II - 1985 - 1986 DSARC III - 1988 -1989
64725/2751, Indirect Identification Subsystem	Provides development and demonstration of techniques to exploit existing sensor, processing, and communications systems to collect, correlate and disseminate identification information from a variety of command and control elements to the weapon system users. Initial efforts will use limited electronic support measures data to demonstrate the feasibility of using this type of data in improving the overall identification process. This is a FY 83 start. Work prior to FY 83 is conducted under 64725/2597.	Contract award for ESM sensor and associated data processor - Dec 82 Design and Fabrication - FY83-84 CONUS Test - Jul 84 In-Theater Demo - Dec 84 Transition Indirect ID Improvements - 1985-1988
64735/2152, Mission Engineering Support	Provides contractor furnished engineering and technical support for the total effort under P.E. 64735.	On-going support including studies; assessments and analyses; engineering; specification formulation; and statement of work preparation.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64735/2286, Range Equipment	Previous Threat Systems (64735/2285) and Range Instrumentation (64735/2286) projects have been combined into this project effective FY83. This project develops systems which simulate enemy radars, jamming equipment, IFF systems and C^2 systems. It also provides for studies and development efforts required to observe, measure, record and control aircraft and other functional systems/subsystems during test and training activities on ranges.	Continue development for ACMIs, AN/MPS-TYY, AN/MSQ-T13, AN/MSQ-T11, GCI-C^2, LAWS, MTE Update, OBEWS, and LATR; Begin development work on GPS Integration, - FY82-83 Complete development for AN/MPS-TYY, AN/MSQ-T13, and GCI-C^2; Continue development on ACMIs, AN/MSQ-T11, LAWS, MTE update, OBEWS, and LATR; Initiate development on ATSPI/RMS II, airborne platforms, drone control/GPS TM relay and STRC ADS - FY84 Identify and develop new range instrumentation systems and threat radar simulators as funds and intelligence become available - FY85-88
64735/6510, Flight Test Simulators	This project provides for development and acquisition of threat radars and associated instrumentation to test the effectiveness and utility of EW systems.	FY83 and 84 development efforts include CROSS-BOW, SADS VIII, SADS X, SADS XI, SADS XI M/A, simulator modifications, WEST IV, airborne reference radar and SARS VI. FY85-88 developments will consist of new threat radar simulators responsive to intelligence updates.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64737/2712, Airborne Self-Protection Jammer (ASPJ) Common Development	This is a joint Air Force/Navy program for the engineering development of a common internally mounted self-protection electronic counter-measures jammer for various tactical aircraft. Related projects in support of specific ASPJ applications include 64737/2715 ALQ-131/CPMS Development/Integration; and 64737/2719, F-16/ASPJ Development/Integration.	Phase II FSD Contract Award - Aug 81 Complete DT&E - Jul 84 Complete IOT&E - Oct 85 DSARC III - Feb 86 Production Contract - Jul 86
64737/2715, ALQ-131/ Comprehensive Power Management System (CPMS) Development/ Integration	This project adapts the ASPJ receiver/ processor (R/P) to provide a Comprehensive Power Management System (CPMS) for the ALQ-131 ECM pod.	Design, critical item demonstration and integration into the ALQ-131 - FY82-83 Initiate DT&E of the CPMS with the ALQ-131 - FY84 IOT&E - FY85-86 DSARC III - FY86
64737/2719, F-16/ ASPJ Development Integration	This project supports the integration of the ASPJ into the F-16 and development of support equipment for the ALQ-165.	Complete F-16 prototype installation; Conduct aircraft radar cross section and antenna pattern measurements; Start DT&E - FY83 Complete DT&E/IOT&E - May 85 DSARC III - Feb 86
64738/1627, Simulation, Analysis, and Evaluation		
64738/2114, Antenna Test Range	Provides acquisition and continuous update of precision EW antenna test capability employing shells of B-52, F-4, A-10, and F-111 aircraft.	FY83 testing will focus on various HAVE EXIT antenna configurations and the ALQ-172 phased array FSED effort.

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64738/2683, Mono-pulse Radar Countermeasures		
64738/3829, Infrared and Optical Countermeasures		
64738/5615, B-52 Protective Systems	Provides for development of new or modified ECM equipment for B-52 applications.	
64738/5616, F/FB-111 Protective Systems	Provides for development of new or modified ECM equipment for F/FB-111 strategic applications.	Complete tail warning system integration study; Begin integration of monopulse capability; Initiate replacement/improvement of the countermeasures dispenser system - FY83
64739/2272, Active Countermeasure Systems		Active IRCM Development Start - Sep 82 ALQ-131 R/P Pilot Production Decision - Feb 83 Active IRCM System Production Decision - 4Q/85
64739/2273, Warning Systems		
64739/2274, Dispensers and Expendables	Provides for development and improvement of dispensers, chaff, flares, and other expendables to counter the expanding air-to-air and ground-to-air threat.	

AVIONICS DEVELOPMENT PROGRAMS

PRORGRAM	DESCRIPTION	MILESTONES
64739/2879, Electronic Warfare Reprogramming Update	Provides automated tools for rapid analysis, assessment and trade-off decision making during the EW software reprogramming process.	Contract Award - FY 1/83 Prototype Delivery; Initial hardware and software development and system integration - FY84 Complete development and integration efforts; Conduct DT&E; System IOC; Procure additional systems - FY85-88
64739/5618, F-15 Protective Systems		
64740/2239, Computer Security (COMPSEC) Technology	This project provides technology transfer of advanced multi-level computer security technologies, techniques and validation procedures to meet USAF COMPSEC requirements.	Continue support for the Korean Air Intelligence System Secure Interface for the U.S., the MAC secure data base management system, and the Air Force Audit Agency/Air Force Accounting and Finance Center. - FY83 Continue multi-level computer security efforts emphasizing involvement of the commercial sector; Develop a modeling system for prediction/prevention of security hazards; Support the National Security Agency (NSA) Computer Security Center (CSC) in joint secure efforts to coordinate DOD "trusted system" research, development and verification techniques; Develop a military specification for small, stand-alone computer systems - FY84 Underwrite the introduction of commercial computer kernal security technology into Air Force systems; Demonstrate computer security technology for tactical C^3 systems. Continue supporting the DOD consortion and the NSA CSC; Develop a protoype small stand-alone secure computer system. - FY85-88

PROGRAM	DESCRIPTION	MILESTONES
64740/2522, Requirements Analysis	This project develops tools to identify cost, risk areas and implementation altenratives before acquiring automated systems.	Develop User-System Interface (USI) Guidelines for two new requirements analysis tools: The Document Writer (DOC WRITER) and the Automated Requirements Development System (ARDS) - FY83 Upgrade and proliferate the Automatic Interactive Simulation Modeling (AISIM), ARDS and DOC WRITER in system program offices; Rehost these tools to other DOD computers; Review USI guidelines for human factors considerations; Apply USI guidelines extensively in USAF program offices - FY84 Continue to enhance, maintain and assist in the use of tools in performance modeling and requirements engineering; Publish the final set of USI guidelines as a supplement to USAFs Human Factors Design Handboook; Produces a military standard on USI design - FY85-88
64740/2523, Management Control Technology	Develop tools and techniques for control of the acquisition and support of computer resources. Areas of emphasis include methods to define/control software configuration items; management tools for visibility and control of software development and support; ways to track and account for ECPs; and tools methods to track and account for costs and requirements.	Continue support for the Joint Logistics Commanders (JLC) task on a military standard for software engineering (includes development of joint MIL-STDs and Data Item Decriptions); Conduct a pilot application of a software cost data estimation and modeling system - FY83 Continue supporting JLC tasks; Evaluate pilot application of the Software Acquisition Resource Expenditure (SARE) cost collection and monitoring system - FY84 Complete a standard Data Item Description (DID) for software cost estimation and monitoring; Employ the SARE cost collection and monitoring system in several SPOs and software support centers. - FY85-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64740/2652 Computer Architecture Standards	Develops instruction set architecture (ISA) standards for armament, C^3I, reconnaissance/surveillance, avionics, space, and signal avionics, space, and signal processing	Continued support for MIL-STD-1750A User Group and Army-Air Force NEBULA Control Board; Conduct studies of MIL-ST-1750A tool sets and C^3I application of MIL-STD-1750; Begin studies on the synergy of architecture standards for C^3 - FY83 Continue support for USAF participation in the tri-service military computer family; Begin work on the first ground-based 1750A application; Evaluate support software for Air Force 16-bit and 32-bit standard ISAs; Continue work on the synergy of architecture standards for C^3 - FY84 Continue support for the tri-service military computer family project and SPO applications of 1750A; Complete development of a set of standards for Air Force embedded computer systems; Develop an architecture control facility for ISA standards - FY85-88
64742/1190, Precision Location Strike System	Provides for PLSS development and testing.	Critical Design Review - Mar 83 System Integration and Contractor Testing - FY83-84 Start DT&E/IOT&E - May 84

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64747/1209, Nuclear Effects Simulation Test Facilities	Provides facilities and R&D test support for nuclear EMP testing.	Provide test support for B-52, FB-111 & Missile programs - FY82-83 Continued test support for aircaft & missiles programs; Begin facility upgrade for E-4B testing to begin in FY86 - FY84 Provide R&D test support for E-4B and other aircraft - FY85-88
64753/2843, Combat Helicopter Modernization, Basic Program	Provides for development of a combat rescue/special operations derivative of the UH-60 with a state-of-the-art avionics suite which enables low level flight at night and in adverse weather. The tasks consist of sub-system development, integration and flight test.	Begin FSD - Oct 82 Limited Production Decision - Jul 83 Begin Flight Test - FY84 Major Production Decision - FY85 IOC - FY87
64754, Joint Tactical Information Distribution (JTIDS)	Develops a highly jam resistant, secure digital information distribution system (data link) between E-3A and ground C^2 centers and fighter aircraft. Class 2 terminal installation is planned for the F-15.	Start Production of Ground Terminal - Sep 82 Deliver Fighter Development Terminal - Aug 83 Fighter Terminal Production Decision - Jun 85
64756/2037, Side Looking Airborne Radar (SLAR) Sensor	Provides for development and test of Advanced Synthetic Aperture Radar System (ASARS).	Complete Phase II (Final Product Baseline Established) - Sep 83 Complete Phase III (Product Improvements Completed) - Sep 88
64756/2451, SLAR Exploitation		Complete Phase II (Prototype - Baseline) - Sep 84 Complete Phase III (Product Improvements) - Sep 88

ANNEX B

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
64778, NAVSTAR Global Positioning System (GPS)	Provides FSED of satellites and control segment; funding for Air Force share of user equipment FSED; and funding for operation of development satellites and control segment to support user equipment testing. Included in the satellite development effort is extended life span (6 years average), nuclear/laser hardening and capability to carry Integrated Operational NUDET Detection System (IONDS) payload with cross links.	Operational Satellite Production Start - 4Q FY82 User Equipment IOT&E Start - 4Q FY83 DSARC III - 3Q FY84 Complete IOT&E of Representative Set of User Equipment - 4Q FY84 Air Force User Equipment Production Start - 4Q FY84 Worldwide Three-Dimensional Operational Capability (18 - Satellite) - 1Q FY89
64779, Joint Interoperability of Tactical Command and Control Systems (JINTACCS)	This is a joint service program, with Army serving as executive agent, to improve operational effectiveness of services tactical command and control systems in support of joint operations. Participating Air Force systems include Tactical Air Control System (TACS), Tactical Air Intelligence system (TAIS), E-3A and Joint Tactical Information and Distribution System (JTIDS).	Intelligence/Air Operations Operational Effectiveness Demonstration (OED) - May 83 Initiate Amphibious Development Certification (DC) Testing - Jul 83 Comprehensive OED - May 85 Initiate TADIL-J DC Testing - Sep 85 TADIL-J OED - May 85

AVIONICS DEVELOPMETN PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
65708/688G, Aircraft Navigation Verification	This effort determines the navigational performance, operability, and a limited assessment of reliability of aircraft navigation systems for DOD. The Central Inertial Guidance Test Facility (CIGTF) performs ground and flight evaluation of contractor furnished aircraft navigation systems prior to their selection for production by DOD agencies.	On-going testing activities including completion of three high accuracy standard inertial navigators in cargo fighter and helicopter aircraft; and strapdown ring laser gyro inertial systems evaluations. A strapdown inertial reference will be incorporated into the Completely Integrated Reference Instrumentation System (CIRIS) to improve its accuracy and reliability - FY83 Continued verification and developmental testing of navigation systems with emphasis on radio and radar aided inertial navigation systems. A GPS update capability will be added to CIRIS to increase system flexibility - FY84 Continued testing and verifications activity with emphasis on aided interial systems - FY85-88
65708/2900 Radar Target Scattering (RATSCAT) Facility UpGrade	Provides a general update of RATSCAT capabilities in support of all DOD users. Included in the update are the radar measurement system, rotators, ratators,data links and calibration systems.	Continued RATSCAT modernization activities; Initial development of a major new test complex for classified programs - FY82-83 Initial operation of the new test complex; Completion of studies to define needed improvements - FY84 On-going upgrade activities to keep pace with changing technology - FY85-88

AVIONICS DEVELOPMENT PRORAMS

PROGRAM	DESCRIPTION	MILESTONES
71112, Embedded Computer Systems Improvement Program	Provides contractual support for an AFLC effort to improve support capabilities for embedded computer systems. The current support effort is manpower intensive, users nonstandard support tools, has support systems that are system unique, has limited reprogramming capability and uses old techniques for management and engineering. This effort concentrates on ECS support from generic ECS support concepts and impacts every modern weapon system. The program consists of five projects: ECS readiness support, Networks, Extendable integrated support facilities, Standardization/automation, and Engineering practices. This is an FY84 new start.	Initial planning activities - FY82-83 System design, custom software development and network design - FY84 New systems and networks will be tested, refined, integrated and operationally supported/maintained - FY85-88

AVIONICS DEVELOPMENT PROGRAMS

PROGRAM	DESCRIPTION	MILESTONES
78011, Industrial Preparedness	This is a continuing program which consists of four interrelated efforts: (1) Maintenance, rehabilitation and modernization of Air Force-owned, contractor-operated facilities/equipment;(2) Industrial base planning;(3) Manufacturing Technology (MANTECH); and (4) Industrial productivity and responsiveness improvement.	Initial planning study and analysis activity to support high-payoff MANTECH efforts,encourage academic participation in the MANTECH effort, establish industrial base planning methodology and conduct production base and planning analyses - FY82-83 Perform key mission related thrust with MANTECH including intelligent task automation; computer aided engineering for forging die design and manufacturing; processing for improved fabrication yield of HgCdTe IR detector; intelligence interactive curing of composities; closed loop processing of optical coatings; and computer planning, management and control of electronic packaging. - FY84 Transition results to procurement and O&M funded MANTECH efforts; Continue existing programs not ready for transfer; initiate new efforts based on planning guidance - FY85-88
78026, Productivity Reliability, Availability, Maintainability (PRAM)	This is an on-going Chief of Staff directed effort to selectively invest funds for reduced ownership cost and improved operational readiness. Implementation is accomplished via Class IV Modification funding, technical order changes, preferred spares, etc. The avionics portion has consisted of approximately 20 percent of the PRAM projects and 30 to 50 percent of the projects and 30 to 35 percent of the dollars invested.	This program consists of many on-going and new projects with varying durations and completion dates.

ANNEX C

AVIONICS MODIFICATIONS

This annex lists avionics-related class IV and V modification programs in numeric order by modification number. Funding data and schedules were taken from the current Aircraft Modification Funding Plan (P3x Report), and the G079 data system (SEMMP). Class V modifications are those modifications that add a new mission capability to a weapon system (4 digit mod number). Class IV modifications improve the efficiency/effectiveness of system/equipment without providing a new capability. Equipment which is being installed or being modified is shown with the equipment nomenclature, functional area (FUN) and number of current installations (INS). Functional area abbreviations and subfunctional area abbreviations are shown in Table 2-2. Modification installation schedules and budge' years are shown, however, number of installations are not always available.

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
103098	SIG DATA CONVERT	TA/S	CV-2497A	0	F-111F		82		2.7		
							83		3.4		
103093	SIG DATA CONVERT	TA/S	CV-2992A	0	F-111D		82		2.7		
							83		3.4		
103103	RADAR RECEIVER				F-111A		82		2.2	BAYARD	SM-ALC/MMKREM 633-2590
							83		3.9		
							84		0.0		
					F-111D		82		2.2	BROWN	SM-ALC/MMKREF 633-2452
							83		3.9		
							84		0.0		
					F-111E		82		2.2	BAYARD	SM-ALC/MMKREM 633-2590
							83		3.9		
							84		0.0		
					F-111F		82		2.2	PEREZ	SM-ALC/MMKREM 633-2590
							83		3.9		
							84		0.0		
					FB-111A		82		2.2		
							83		3.9		
							84		0.0		
10349C	ALR 69 CORRECT				A-10A		82		0.0	COSEY	WR-ALC/MMRMT 468-6136
							83		5.6		
							84		7.7		
							85		10.9		
104023	FSAS	FL	CAMM	0	C-135A/N		81	0	6.1	BERRIDGE	MAC/XPQS 638-3908
							82	0	45.7		
							83	0	42.2		
							84	3	8.2		
							85	0	3.3		
							86	0	0.1		
				0	C-135B/C		81	0	6.1	BERRIDGE	MAC/XPQS 638-3908
							82	0	45.7		
							83	1	42.2		
							84	5	8.2		
							85	1	3.3		
							86	0	0.1		
				0	EC-135A	SAC 10-79	81	0	6.1	PARTRIDGE	OC-ALC/MMSG 735-5836
							82	0	45.7		
							83	1	42.2		
							84	4	8.2		
							85	0	3.3		
							86	0	0.1		
				0	EC-135B	SAC 10-79	81	0	6.1	PARTRIDGE	OC-ALC/MMSG 735-5836
							82	0	45.7		
							83	0	42.2		
							84	2	8.2		

NUMBER	TITLE	FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82
104023	FSAS	FL	CAMM	0	EC-135B		85	0	3.3	
							86	0	0.1	
				0	EC-135C	SAC 10-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	3	42.2	
							84	7	8.2	
							85	3	3.3	
							86	0	0.1	
				0	EC-135G	SAC 10-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	2	42.2	
							84	1	8.2	
							85	1	3.3	
							86	0	0.1	
				0	EC-135H	SAC 10-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	1	42.2	
							84	3	8.2	
							85	1	3.3	
							86	0	0.1	
				0	EC-135J	SAC 10-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	1	42.2	
							84	1	8.2	
							85	2	3.3	
							86	0	0.1	
				0	EC-135K	SAC 10-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	2	42.2	
							84	0	8.2	
							85	0	3.3	
							86	0	0.1	
				0	EC-135L	SAC 10-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	1	42.2	
							84	2	8.2	
							85	2	3.3	
							86	0	0.1	
				0	EC-135N	SAC 10-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	1	42.2	
							84	3	8.2	
							85	1	3.3	
							86	0	0.1	
				0	EC-135P	SAC 10-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	0	42.2	
							84	2	8.2	
							85	0	3.3	
							86	0	0.1	

AD-A125 819 USAF (UNITED STATES AIR FORCE) AVIONICS MASTER PLAN(U) 3/3
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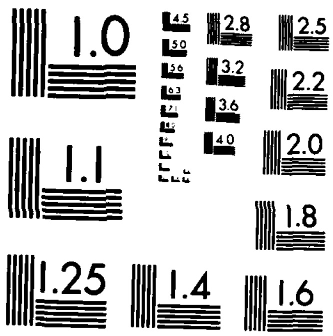

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR	SCHEDULE	$	POINT OF CONTACT DEC 82
104029	FSAS	FL	CAMM	0	KC-135A		81	0	6.1	
							82	0	45.7	
							83	36	42.2	
							84	315	8.2	
							85	272	3.3	
							86	10	0.1	
				0	KC-135D	MAC 6-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	2	42.2	
							84	0	8.2	
							85	2	3.3	
							86	0	0.1	
				0	KC-135Q		81		6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82		45.7	
							83		42.2	
							84		8.2	
							85		3.3	
							86		0.1	
				0	NKC-135A	SAC 10-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	4	42.2	
							84	0	8.2	
							85	5	3.3	
							86	0	0.1	
				0	RC-135M/W	SAC 10-79	81		6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82		45.7	
							83		42.2	
							84		8.2	
							85		3.3	
							86		0.1	
				0	RC-135S	SAC 10-79	81		6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82		45.7	
							83		42.2	
							84		8.2	
							85		3.3	
							86		0.1	
				0	RC-135T	SAC 10-79	81	0	6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82	0	45.7	
							83	0	42.2	
							84	0	8.2	
							85	1	3.3	
							86	0	0.1	
				0	RC-135U	SAC 10-79	81		6.1	PARTRIDGE OC-ALC/MMSG 735-5836
							82		45.7	
							83		42.2	
							84		8.2	
							85		3.3	
							86		0.1	
				0	RC-135V		81		6.1	
							82		45.7	

NUMBER	TITLE	FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82
104029	FSAS	FL	CAMM	0	RC-135V		83		42.2	C
							84		8.2	
							85		3.3	
							86		0.1	
				0	WC-135B		81	0	6.1	BERRIDGE MAC/XPQS 638-3908
							82	0	45.7	PARTRIDGE OC-ALC/MMSG 735-5836
							83	2	42.2	
							84	3	8.2	
							85	2	3.3	
							86	0	0.1	
104028	FSAS	FL	FUEL-ADV	1	C-141B		81	0	10.8	MILLIGAN ASD/AEAA 785-4568
							82	54	19.1	WRIGHT WR-ALC/MMSH 468-2686
							83	215	6.6	
				2	C-5A		81	0	0.0	EUBANKS WR-ALC/MMSRAB 468-2922
							82	2	0.1	SCHESINGER MAC/XPQS 638-3908
							83	28	0.8	
							84	45	1.2	
							85	2	0.1	
10571A	INCORP VOICE WRN				F-4C		80	0	4.9	
							81	0	4.1	
							82	0	4.7	
							83	165	6.6	
							84	80	4.0	
							85	25	0.7	
					F-4D		80	0	4.9	
							81	0	4.1	
							82	0	4.7	
							83	258	6.6	
							84	175	4.0	
							85	24	0.7	
					F-4E		80	0	4.9	
							81	0	4.1	
							82	2	4.7	
							83	197	6.6	
							84	273	4.0	
							85	60	0.7	
					F-4G		80	0	4.9	
							81	0	4.1	
							82	15	4.7	
							83	75	6.6	
							84	17	4.0	
							85	0	0.7	
					RF-4C		80	0	4.9	
							81	0	4.1	
							82	1	4.7	
							83	50	6.6	
							84	64	4.0	
							85	16	0.7	

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
10603*	FLIGHT DATA REC CD	MXU-FDR	0	AC-130A	AFISC 1-79	82	3	1.0	KELLER	WR-ALC/MMSRB3 468-6281
						83	0	8.3	MCCRARY	WR-ALC/MMIRCA 468-3737
						84	0	0.9	MINNICK	MAC/LGMA 638-2059
						85	5	11.9		
						86	4	5.4		
						87	1	0.5		
			0	AC-130H		82	0	1.0	MINNICK	MAC/LGMA 638-2059
						83	1	8.3		
						84	0	0.9		
						85	0	11.9		
						86	9	5.4		
						87	0	0.5		
			0	C-130A	AFISC 1-79	82	0	1.0	KELLER	WR-ALC/MMSRB3 468-6281
						83	2	8.3	MCCRARY	WR-ALC/MMIRCA 468-3737
						84	0	0.9	MINNICK	MAC/LGMA 638-2059
						85	96	11.9		
						86	13	5.4		
						87	0	0.5		
			0	C-130B	AFISC 1-79	82	0	1.0	KELLER	WR-ALC/MMSRB3 468-6281
						83	2	8.3	MCCRARY	WR-ALC/MMIRCA 468-3737
						84	3	0.9	MINNICK	MAC/LGMA 638-2059
						85	28	11.9		
						86	53	5.4		
						87	3	0.5		
			0	C-130D	AFISC 1-79	82	0	1.0	KELLER	WR-ALC/MMSRB3 468-6281
						83	1	8.3	MCCRARY	WR-ALC/MMIRCA 468-3737
						84	4	0.9	MINNICK	MAC/LGMA 638-2059
						85	2	11.9		
						86	2	5.4		
						87	0	0.5		
			0	C-130E	AFISC 1-79	82	0	1.0	MINNICK	MAC/LGMA 638-2059
						83	2	8.3		
						84	51	0.9		
						85	62	11.9		
						86	83	5.4		
						87	77	0.5		
			0	C-130H	AFISC 1-79	82	0	1.0	KELLER	WR-ALC/MMSRB3 468-6281
						83	1	8.3	MCCRARY	WR-ALC/MMIRCA 468-3737
						84	20	0.9	MINNICK	MAC/LGMA 638-2059
						85	45	11.9		
						86	14	5.4		
						87	5	0.5		
			0	EC-130E	AFISC 1-79	82	0	1.0	KELLER	WR-ALC/MMSRBB 468-6281
						83	1	8.3	MCCRARY	WR-ALC/MMIRCA 468-3737
						84	3	0.9		
						85	2	11.9		
						86	5	5.4		
						87	0	0.5		
			0	HC-130H	AFISC 1-79	82	0	1.0	KELLER	WR-ALC/MMSRB3 468-6281

NUMBER	TITLE	FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
10603A	FLIGHT DATA REC	CD	MXU-FDR	0	HC-130H		83	2	8.3	MCCRARY	WR-ALC/MMIRCA 468-3737 C
							84	1	0.9	MINNICK	MAC/LGMA 638-2059
							85	5	11.9		
							86	13	5.4		
							87	4	0.5		
				0	HC-130N	AFISC 1-79	82	0	1.0	KELLER	WR-ALC/MMSRBB 468-6281
							83	1	8.3	MCCRARY	WR-ALC/MMIRCA 468-3737
							84	0	0.9	MINNICK	MAC/LGMA 638-2059
							85	0	11.9		
							86	12	5.4		
							87	0	0.5		
				0	HC-130P	AFISC 1-79	82	0	1.0	KELLER	WR-ALC/MMSRBB 468-6231
							83	0	8.3	MCCRARY	WR-ALC/MMIRCA 463-3737
							84	0	0.9	MINNICK	MAC/LGMA 638-2059
							85	17	11.9		
							86	1	5.4		
							87	0	0.5		
				0	WC-130E	AFISC 1-79	82	0	1.0	KELLER	WR-ALC/MMSRBB 468-6281
							83	1	8.3	MCCRARY	WR-ALC/MMIRCA 463-3737
							84	0	0.9	MINNICK	MAC/LGMA 638-2059
							85	0	11.9		
							86	5	5.4		
							87	0	0.5		
				0	WC-130H	AFISC 1-79	82	0	1.0	KELLER	WR-ALC/MMSRBB 468-6281
							83	0	8.3	MCCRARY	WR-ALC/MMIRCA 468-3737
							84	0	0.9	MINNICK	MAC/LGMA 638-2059
							85	7	11.9		
							86	3	5.4		
							87	5	0.5		
10611C	RADAR ALTIMETER	N	CARA	0	A-10A		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	A-7D		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	A-7K		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	AC-130A		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
10611C	RADAR ALTIMETER	N	CARA	0	AC-130A		83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	AC-130H		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	B-52H		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	C-130A		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	C-130B		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	C-130D		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	C-130E		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	C-130H		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR	SCHEDULE	$	POINT OF CONTACT DEC 82		
10611C	RADAR ALTIMETER	N	CARA	0	C-130H		85		14.4			C
							86		7.7			
							87		7.4			
							88		0.0			
				0	C-141B		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059	
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
							88		0.0			
				0	C-5A		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059	
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
							88		0.0			
				0	C/NC-141A		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3			
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
							88		0.0			
				0	CH-3E		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059	
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
				0	CH-53C		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059	
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
				0	EC-130E		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3			
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
							88		0.0			
				0	EF-111A		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3	SAGE	SM-ALC/MMKREF 633-2452	
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			

NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82		
10611C	RADAR ALTIMETER	N	CARA	0	F-111A		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	C
							83	0	1.3			
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
				0	F-111D		82	0	4.5	BROWN	SM-ALC/MMKREF 633-2452	
							83	0	1.3	HARLAN	WR-ALC/MMIMD 468-3287	
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
				0	F-111E		82	0	4.5	BAYARD	SM-ALC/MMKREM 633-2590	
							83	0	1.3	HARLAN	WR-ALC/MMIMD 468-3287	
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
				0	F-111F		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3	PEREZ	SM-ALC/MMKREM 633-2590	
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
				0	F-16A		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3			
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
							88		0.0			
							89		0.0			
							90	518	0.0			
				0	F-16B		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3			
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
							88		0.0			
							89		0.0			
							90	85	0.0			
				0	F-4C		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	
							83	0	1.3			
							84		15.5			
							85		14.4			
							86		7.7			
							87		7.4			
							88		0.0			
				0	F-4D		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287	

NUMBER	TITLE	FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
10611C	RADAR ALTIMETER	N	CARA	0	F-4D		83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	F-4E		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	F-4G		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	FB-111A		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							33	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	HC-130H		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	HC-130N		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				C	HC-130P		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	HH-3E		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 83
10611C	RADAR ALTIMETER	N	CARA	0	HH-3E		87		7.4		
				0	HH-53B		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	HH-53C		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	HH-53H		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	MC-130E		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	RF-4C		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	T-43A		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	TH/UH-1F		82	0	4.5	THEOBALD	MAC/LGMA 638-2059
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
				0	UH-1N		82	0	4.5	THEOBALD	MAC/LGMA 638-2059
							83	0	1.3		
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
10611C	RADAR ALTIMETER	N	CARA	0	WC-130E		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	WC-130H		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
							88		0.0		
				0	WC-135B		82	0	4.5	HARLAN	WR-ALC/MMIMD 468-3287
							83	0	1.3	THEOBALD	MAC/LGMA 638-2059
							84		15.5		
							85		14.4		
							86		7.7		
							87		7.4		
10613B	UPDATE RWR	EC	ALR-46	201	A-10A		81		7.6		
							82		13.2		
							83		22.8		
				0	A-7D		81		7.6		
							82		13.2		
							83		22.8		
				0	A-7K		81		7.6		
							82		13.2		
							83		22.8		
				0	AC-130A		81		7.6	SMITH	MAC/XPQS 638-3908
							82		13.2		
							83		22.8		
				60	B-52D		81		7.6		
							82		13.2		
							83		22.8		
				0	B-52G		81		7.6		
							82		13.2		
							83		22.8		
				0	B-52H		81		7.6		
							82		13.2		
							83		22.8		
				34	F-4C		81		7.6		
							82		13.2		
							83		22.8		
				0	F-4E		81		7.6		
							82		13.2		
							83		22.8		
				0	HH-53B		81		7.6	ROWLAND	MAC/XPQS 638-3908
							82		13.2		

C

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR	SCHEDULE $	POINT OF CONTACT DEC 82	
106133	UPDATE RWR	EC	ALR-46	0	HH-53B		83	22.8		
				22	HH-53C		81	7.6	ROWLAND	MAC/XP2S 638-3903
							82	13.2		
							83	22.8		
				0	OV-10A		81	7.6		
							82	13.2		
							83	22.8		
				0	RF-4C		81	7.6		
							82	13.2		
							83	22.8		
113043	INERTIAL REF UNI				F-111D		81	7.1		
							82	3.5		
					F-111F		81	7.1		
							82	3.5		
					FB-111A		81	7.1		
							82	3.5		
114088	RADAR UPGRADE				B-52G		84	90.9		
							85	112.6		
							86	115.4		
							87	70.7		
							88	74.1		
							89	31.1		
					B-52H		84	90.9		
							85	112.6		
							86	115.4		
							87	70.7		
							88	74.1		
							89	31.1		
116028	DIGITAL SCAN CON	TA/S	APQ-126	164	A-7D		81	10.5	STOCKTON	OC-ALC/MMSF 735-7671
							82	16.2	WALLEN	OC-ALC/MMSF 735-3547
							83	15.5		
							84	10.4		
							85	0.0		
							86	0.0		
							87	0.0		
116028	DIGITAL SCAN CON	TA/S	DSCG	164	A-7D		81	10.5	STOCKTON	OC-ALC/MMSF 735-7671
							82	16.2	WALLEN	OC-ALC/MMSF 735-3547
							83	15.5		
							84	10.4		
							85	0.0		
							86	0.0		
							87	0.0		
116038	APY-1 RADAR SYS	RE	APY-1	24	E-3A		84	3.2		
							85	6.1		
116228	IMPROV NAV SYS				HH-53B		84	5.2		

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MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	
11622B	IMPROV NAV SYS				HH-53C		84		5.2		
					HH-53H		84		5.2		
12504B	APQ-99 UPDATE	TA/S	APQ-99	0	RF-4C		84		17.0		
							85		38.4		
							86		56.0		
							87		6.5		
12613B	MODRNZE DEF FC	TA/S	ASG-15	0	B-52G		83		2.0		
							84		13.0		
							85		44.2		
							86		42.0		
13315A	STALL INHIBIT SY FL		SIS	61	F-111A		79		24.0	BAYARD	SM-ALC/MMKREM 633-2590
							80		0.5		
							81		2.6		
							82	32	1.7		
							83	13	0.1		
							84	14	0.0		
							85	0	0.0		
				2	F-111E		79		24.0	BAYARD	SM-ALC/MMKREM 633-2590
							80		0.5		
							81		2.6		
							82	0	1.7		
							83	1	0.1		
							84	0	0.0		
16405B	DOPPLER RADAR	N	APN-218	2	C-135B/C		79		27.8	LUCIANO	OC-ALC/MMIMC 735-2318
							80		33.2	THEOBALD	MAC/LGMA 638-2059
							81		29.0		
							82	5	5.1		
							83	0	1.8		
							84	0	0.2		
				3	EC-135A		79		27.8	SIZEMORE	WR-ALC/MMIMD 468-3287
							80		33.2		
							81		29.0		
							82	1	5.1		
							83	0	1.8		
							84	0	0.2		
				0	EC-135B		79	0	27.8		
							80	0	33.2		
							81	0	29.0		
							82	0	5.1		
							83	2	1.8		
							84	0	0.2		
				5	EC-135C		79		27.8	SIZEMORE	WR-ALC/MMIMD 468-3287
							80		33.2		
							81		29.0		
							82	4	5.1		
							83	1	1.8		

NUMBER	TITLE	FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82
164058	DOPPLER RADAR	N	APN-218		5 EC-135C		84	0	0.2	
					1 EC-135G		79		27.8	SIZEMORE WR-ALC/MMIMD 468-3287
							80		33.2	
							81		29.0	
							82	2	5.1	
							83	0	1.8	
							84	0	0.2	
					3 EC-135H		79		27.8	
							80		33.2	
							81		29.0	
							82	1	5.1	
							83	0	1.8	
							84	0	0.2	
					1 EC-135J		79	0	27.8	SIZEMORE WR-ALC/MMIMD 468-3287
							80	0	33.2	
							81	0	29.0	
							82	0	5.1	
							83	0	1.8	
							84	0	0.2	
					0 EC-135K		79	0	27.8	SIZEMORE WR-ALC/MMIMD 468-3287
							80	0	33.2	
							81	0	29.0	
							82	0	5.1	
							83	2	1.8	
							84	0	0.2	
					3 EC-135L		79		27.8	SIZEMORE WR-ALC/MMIMD 468-3287
							80		33.2	
							81		29.0	
							82	2	5.1	
							83	0	1.8	
							84	0	0.2	
					2 EC-135N		79		27.8	SIZEMORE WR-ALC/MMIMD 468-3287
							80		33.2	
							81		29.0	
							82	4	5.1	
							83	1	1.8	
							84	0	0.2	
					0 EC-135P		79	0	27.8	SIZEMORE WR-ALC/MMIMD 468-3287
							80	0	33.2	
							81	0	29.0	
							82	1	5.1	
							83	0	1.8	
							84	0	0.2	
					542 KC-135A		79		27.8	SIZEMORE WR-ALC/MMIMD 468-3287
							80		33.2	
							81		29.0	
							82	305	5.1	
							83	89	1.8	
							84	0	0.2	
					4 NKC-135A		79		27.8	SIZEMORE WR-ALC/MMIMD 468-3287

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
16405B	DOPPLER RADAR	N	APN-218	4	NKC-135A		80		33.2		
							81		29.0		
							82	0	5.1		
							83	0	1.8		
							84	0	0.2		
				3	WC-135B		79		27.8	SIZEMORE	WR-ALC/MMIMD 468-3287
							80		33.2	THEOBALD	MAC/LGMA 638-2059
							81		29.0		
							82	3	5.1		
							83	0	1.8		
							84	0	0.2		
16509B	APQ-120 ALT LINE TA/S		APQ-120	27	F-4E		78		3.4	COLLARD	OO-ALC/MMIPM 458-7374
							79		0.0	NORTHAM	OO-ALC/MMSR 458-6164
							80		0.0		
							81		0.4		
							82		0.0		
							83	1	0.4		
							84	12	0.0		
							85	3	0.1		
16620C	HF SSB GROUP A				E-4A		83		1.4		
							84		0.6		
					E-4B		83		1.4		
							84		0.6		
16620C	HF RADIO	C	ARC-190	0	B-52G		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3	WILKINS	OC-ALC/MMHHM 735-3573
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				6	B-52H		80		0.8	BROWN	OC-ALC/MMHRMA 735-3371
							81		10.3	HANEY	WR-ALC/MMIMC 468-3675
							82		18.0	WILKINS	OC-ALC/MMHHM 735-3573
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	C-141B		80		8.6	ERWIN	MAC/LGMA 638-2059
							81		10.3		
							82		18.0		
							83		27.9		

NUMBER	TITLE	FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
16620C	HF RADIO	C	ARC-190	0	C-1419		84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	C-5A		80	0	0.8	ERWIN	MAC/LGMA 638-2059
							81	0	10.3	HANEY	WR-ALC/MMIMC 468-3675
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	C/NC-141A		80		8.6		
							81		10.3		
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	EC-135A		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	EC-135C	MAC 3-77	80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	EC-135G		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		

NUMBER	TITLE	FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT		DEC 82
15620C	HF RADIO	C	ARC-190	0	EC-135G		84		37.4			C
							85		24.9			
							86		25.7			
							87		33.7			
							88		35.5			
							89		23.6			
				0	EC-135H	MAC 3-77	80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675	
							81	0	10.3			
							82		18.0			
							83		27.9			
							84		37.4			
							85		24.9			
							86		25.7			
							87		33.7			
							88		35.5			
							89		23.6			
				0	EC-135J	MAC 3-77	80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675	
							81	0	10.3			
							82		18.0			
							83		27.9			
							84		37.4			
							85		24.9			
							86		25.7			
							87		33.7			
							88		35.5			
							89		23.6			
				0	EC-135K	MAC 3-77	80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675	
							81	0	10.3			
							82		18.0			
							83		27.9			
							84		37.4			
							85		24.9			
							86		25.7			
							87		33.7			
							88		35.5			
							89		23.6			
				0	EC-135L		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675	
							81	0	10.3			
							82		18.0			
							83		27.9			
							84		37.4			
							85		24.9			
							86		25.7			
							87		33.7			
							88		35.5			
							89		23.6			
				0	EC-135N		80	0	0.8			
							81	0	10.3			
							82		18.0			
							83		27.9			

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
16620C	HF RADIO	C	ARC-190	0	EC-135N		84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	EC-135P		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	F-111D		80	0	0.8	BROWN	SM-ALC/MMKREF 633-2452
							81	0	10.3	HANEY	WR-ALC/MMIMC 468-3675
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	F-111E		80	0	0.8	BAYARD	SM-ALC/MMKREM 633-2590
							81	0	10.3	HANEY	WR-ALC/MMIMC 468-3675
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	F-111F		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3	PEREZ	SM-ALC/MMKREM 633-2590
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	FB-111A		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
16620C	HF RADIO	C	ARC-190	0	FB-111A		84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	KC-135A		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	KC-135Q	MAC 3-77	80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	NKC-135A		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	RC-135M/W	MAC 3-77	80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	RC-135U		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		

NUMBER	TITLE	FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
16620C	HF RADIO	C	ARC-190	0	RC-135U		84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
				0	RC-135V		80	0	0.8	HANEY	WR-ALC/MMIMC 468-3675
							81	0	10.3		
							82		18.0		
							83		27.9		
							84		37.4		
							85		24.9		
							86		25.7		
							87		33.7		
							88		35.5		
							89		23.6		
166228	WEATHER RADAR	N	APS-133	200	C-141B		80	0	10.0	COLLINS	WR-ALC/MMSPBM 468-2767
							81		7.5	GERMANI	WR-ALC/MMSH 468-3634
							82	194	3.3	SCHESINGER	MAC/XPQS 638-3908
							83	13	0.2		
				2	C/NC-141A		80	0	1.8	SCHESINGER	MAC/XPQS 638-3908
							81	7	6.6		
							82	13	0.0		
17305A	LARA MULTIPLEXER	N	LARA/MULT	17	F-111A		79		7.1	BAYARD	SM-ALC/MMKREM 633-2590
							80		0.4		
							81		0.2		
							82	2	0.1		
							83	56	2.4		
							84	15	0.1		
							85	0	0.0		
							86	0	0.0		
				5	F-111D		79		7.1		
							80		0.4		
							81	0	0.2		
							82	2	0.1		
							83	56	2.4		
							84	16	0.1		
							85	0	0.0		
				4	F-111E		79		7.1		
							80		0.4		
							81		0.2		
							82	2	0.1		
							83	77	2.4		
							84	0	0.1		
				24	F-111F		79		7.1		
							80		0.4		
							81	0	0.2		
							82	0	0.1		

MODIFICATION NUMBER	TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
17305A	LARA MULTIPLEXER	N	LARA/MULT	24	F-111F		83	88	2.4		
							84	4	0.1		
				1	FB-111A		79		7.1		
							80		0.4		
							81		0.2		
							82	10	0.1		
							83	52	2.4		
							84		0.1		
17612C	ARC-186 SWAP OUT	C	ARC-186	0	C-130A		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1		
							82		0.0		
							83		0.0		
							84		0.0		
				0	C-130B		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1		
							82		0.0		
							83		0.0		
							84		0.0		
				0	C-130D		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1		
							82		0.0		
							83		0.0		
							84		0.0		
				0	C-130E		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1		
							82		0.0		
							83		0.0		
							84		0.0		
				0	C-130H		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1		
							82		0.0		
							83		0.0		
							84		0.0		
				0	C-135A/N		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1	SAWYER	WR-ALC/MMIMC 468-3675
							82		0.0		
				0	C-135B/C	MAC 4-76	80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1	SAWYER	WR-ALC/MMIMC 468-3675
							82		0.0		
				0	EC-130E		80	0	8.6		
							81	0	7.1		
							82		0.0		
							83		0.0		
							84		0.0		
				0	EC-135B		80	0	8.6	SAWYER	WR-ALC/MMIMC 468-3675
							81	0	7.1		
							82		0.0		
				0	EC-135H		80	0	8.6	SAWYER	WR-ALC/MMIMC 468-3675
							81	0	7.1		

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MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
17612C	ARC-186 SWAP OUT	C	ARC-186	0	EC-135H		82		0.0		
				0	EC-135J		80	0	8.6	SAWYER	WR-ALC/MMIMC 468-3675
							81	0	7.1		
							82		0.0		
				0	EC-135N		80	0	8.6	SAWYER	WR-ALC/MMIMC 468-3675
							81	0	7.1		
							82		0.0		
				0	EC-135P		80	0	8.6	SAWYER	WP-ALC/MMIMC 468-3675
							81	0	7.1		
							82		0.0		
				0	HC-130H		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1		
							82		0.0		
							83		0.0		
							84		0.0		
				0	HC-130N		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1		
							82		0.0		
							83		0.0		
							84		0.0		
				0	HC-130P		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1		
							82		0.0		
							83		0.0		
							84		0.0		
				0	MC-130E		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1		
							82		0.0		
							83		0.0		
							84		0.0		
				0	NKC-135A		80	0	8.6	SAWYER	WR-ALC/MMIMC 468-3675
							81	0	7.1		
							82		0.0		
				31	OA-37B		80		8.6		
							81		7.1		
							82		0.0		
				0	RC-135M/W		80	0	8.6	SAWYER	WR-ALC/MMIMC 468-3675
							81	0	7.1		
							82		0.0		
				0	RC-135S		80	0	8.6	SAWYER	WR-ALC/MMIMC 468-3675
							81	0	7.1		
							82		0.0		
				0	RC-135T		80	0	8.6	SAWYER	WR-ALC/MMIMC 468-3675
							81	0	7.1		
							82		0.0		
				0	RC-135U		80	0	8.6	SAWYER	WR-ALC/MMIMC 468-3675
							81	0	7.1		
							82		0.0		
				0	RC-135V		80	0	8.6	SAWYER	WR-ALC/MMIMC 468-3675
							81	0	7.1		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
17612C	ARC-186 SWAP OUT	C	ARC-186	0	RC-135V		82		0.0		
				0	WC-130E		80	0	8.6		
							81	0	7.1		
							82		0.0		
				0	WC-130H		80	0	8.6		
							81	0	7.1		
							82		0.0		
				0	WC-135B		80	0	8.6	ERWIN	MAC/LGMA 638-2059
							81	0	7.1		
							82		0.0		
18246B	RADAR RECEIVER	N	464465	2	F-106A		80		1.9	ZIETZ	SA-ALC/MMSF 945-6148
							81	1	6.9		
							82	1	14.0		
							83	1	0.0		
							84	93	0.9		
							85	21	0.2		
				0	F-106B		80	0	1.9	ZIETZ	SA-ALC/MMSF 945-6148
							81	0	6.9		
							82	0	14.0		
							83	1	0.0		
							84	15	0.9		
							85	4	0.2		
18316B	REDESIGN RADAR	X			F-111D		81		5.0	BROWN	SM-ALC/MMKREF 633-2452
							82		1.5	FOSTER	SM-ALC/MMIR 633-6814
							83		7.7		
							84		6.4		
18317C	REDESIGN EPU	TA/S	APQ-130	0	F-111D		81		3.5	BROWN	SM-ALC/MMKREF 633-2452
							82		0.0	FOSTER	SM-ALC/MMIR 633-6814
							83		14.6		
18420B	AUTO FLIGHT CONT	FL	MA-2	0	B-52G		84		19.3	COLLIER	OC-ALC/MMHRM 735-6025
							85		20.2		
							86		17.3		
							87		12.7		
							88		6.8		
							89		0.0		
				0	B-52H		84		19.3	MCRORIE	OC-ALC/MMGHM 735-3251
							85		20.2		
							86		17.3		
							87		12.7		
							88		6.8		
							89		0.0		
18501B	DIGITAL SCAN CON	TA/S	DSCG	210	F-4D		78	0	2.8	NAYLOR	OO-ALC/MMSPM 458-5436
							79	0	6.2	NORTHAM	OO-ALC/MMSR 458-6154
							80		15.8		
							81	73	3.2		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
185019	DIGITAL SCAN CON	TA/S	DSCG	210	F-4D		82	151	0.0		
							83	0	0.0		
192018	WEATHER RADAR	N	APS-133	0	C-5A		81	0	7.7		SA-ALC/MMSG 945-6206
							82	2	12.7	STURM	MAC/LGMA 638-4537
							83	4	23.2		
							84	46	2.4		
							85	25	1.4		
193048	W/NAV COMPUTER				F-111D		80	0	7.8	BLACK	SM-ALC/MMSRE 633-2454
							81	0	12.9	BROWN	SM-ALC/MMKREF 633-2452
							82	0	8.9		
							83	0	69.3		
							84	0	28.9		
							85	0	0.9		
							86	83	0.8		
					F-111F		80	0	7.8	BLACK	SM-ALC/MMSRE 633-2454
							81	0	12.9	PEREZ	SM-ALC/MMKREM 633-2590
							82	0	8.9		
							83	0	69.3		
							84	0	28.9		
							85	93	0.9		
							86	0	0.8		
					FB-111A		80	0	7.8		
							81	0	12.9		
							82	0	8.9		
							83	0	69.3		
							84	0	28.9		
							85	0	0.9		
							86	63	0.8		
195018	INS IN F-4G	N	ASN-INS	0	F-4G		81	0	19.1	DOBESH	OO-ALC/MMSPM 458-5436
							82	1	5.2	NORTHAM	OO-ALC/MMSR 458-6164
							83	2	8.5		
							84	3	39.6		
							85	44	19.0		
							86	29	14.2		
							87	24	2.6		
							88	0	0.6		
19607A	CVR	CD	CVR	0	AC-130A		80	0	0.6		
							81	0	0.0		
							82	1	1.8		
							83	0	3.4		
							84	0	3.0		
							85	6	1.5		
							86	0	0.3		
				0	AC-130H		80	0	0.6		
							81	0	0.0		
							82	1	1.8		

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
19607A	CVR	CD	CVR	0	AC-130H		83	0	3.4		
							84	0	3.0		
							85	0	1.5		
							86	9	0.3		
				0	C-130A		80	0	0.6	CLUCK	SM-ALC/MMCRACC 633-2654
							81	0	0.0	KELLER	WR-ALC/MMSRB3 468-6281
							82	1	1.8	MINNICK	MAC/LGMA 638-2059
							83	0	3.4		
							84	0	3.0		
							85	115	1.5		
							86	0	0.3		
				0	C-130B		80	0	0.6	KELLER	WR-ALC/MMSRB3 468-6281
							81	0	0.0	MINNICK	MAC/LGMA 638-2059
							82	2	1.8		
							83	0	3.4		
							84	31	3.0		
							85	57	1.5		
							86	3	0.3		
				0	C-130D		80	0	0.6	CLUCK	SM-ALC/MMCRACC 633-2654
							81	0	0.0	KELLER	WR-ALC/MMSRB3 468-6281
							82	1	1.8	MINNICK	MAC/LGMA 638-2059
							83	1	3.4		
							84	6	3.0		
							85	1	1.5		
							86	0	0.3		
				0	C-130E		80	0	0.6	KELLER	WR-ALC/MMSRB3 468-6281
							81	0	0.0	MINNICK	MAC/LGMA 638-2059
							82	2	1.8		
							83	86	3.4		
							84	163	3.0		
							85	23	1.5		
							86	1	0.3		
				0	C-130H		80	0	0.6	KELLER	WR-ALC/MMSRB3 468-6281
							81	0	0.0	MINNICK	MAC/LGMA 638-2059
							82	2	1.8		
							83	1	3.4		
							84	39	3.0		
							85	43	1.5		
							86	0	0.3		
				0	EC-130E		80	0	0.6	CLUCK	SM-ALC/MMCRACC 633-2654
							81	0	0.0	KELLER	WR-ALC/MMSRB3 468-6281
							82	1	1.8		
							83	2	3.4		
							84	2	3.0		
							85	3	1.5		
							86	3	0.3		
				0	HC-130H		80	0	0.6	MINNICK	MAC/LGMA 638-2059
							81	0	0.0		
							82	1	1.8		
							83	1	3.4		

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
19607A	CVR	CD	CVR	0	HC-130H		84	1	3.0		
							85	24	1.5		
							86	1	0.3		
				0	HC-130N		80	0	0.6	CLUCK	SM-ALC/MMCRACC 633-2654
							81	0	0.0	KELLER	WR-ALC/MMSRBB 468-6281
							82	0	1.8	MINNICK	MAC/LGMA 638-2059
							83	0	3.4		
							84	2	3.0		
							85	13	1.5		
							86	0	0.3		
				0	HC-130P		80	0	0.6	KELLER	WR-ALC/MMSRBB 468-6281
							81	0	0.0	MINNICK	MAC/LGMA 638-2059
							82	1	1.8		
							83	0	3.4		
							84	0	3.0		
							85	17	1.5		
							86	1	0.3		
				0	WC-130E		80	0	0.6	MINNICK	MAC/LGMA 638-2059
							81	0	0.0		
							82	0	1.8		
							83	0	3.4		
							84	1	3.0		
							85	5	1.5		
							86	0	0.3		
				0	WC-130H		80	0	0.6	CLUCK	SM-ALC/MMCRACC 633-2654
							81	0	0.0	KELLER	WR-ALC/MMSRBB 468-6281
							82	1	1.8	MINNICK	MAC/LGMA 638-2059
							83	0	3.4		
							84	1	3.0		
							85	13	1.5		
							86	0	0.3		
19608A	IMP.FLIGHT REC S	CD	MKX-383	0	C-141B		81	0	2.3	MCCRARY	WR-ALC/MMIRCA 468-3737
							82	0	5.1	MINNICK	MAC/LGMA 638-2059
							83	4	6.7		
							84	0	1.4		
				0	C/NC-141A		81	0	2.3	MCCRARY	WR-ALC/MMIRCA 468-3737
							82	2	5.1		
							83	171	6.7		
							84	96	1.4		
19611B	MODERNIZE ASG-21	TA/S	ASG-21	0	B-52H		79	0	2.1	BROWN	OC-ALC/MMHRMA 735-6025
							80	0	14.3	WALKER	WR-ALC/MMIRBB 468-2511
							81	0	33.2		
							82		21.3		
							83		0.0		
20146B	MAIN ATTITUDE IN	CD	ARU-30	0	OV-10A		83		0.5		
22124A	ELT	C	ELT	0	O-2A		82		0.1		

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	EQUIPMENT INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82
22124A	ELT	C	ELT	0	O-2A		83		0.2	
2707	TEREC	RE	ALQ-125	16	RF-4C		79	0	55.1	
							80		0.0	
							81	10	28.4	
							82	7	0.8	
							83	0	0.5	
							84	23	2.0	
272483	MADAR DRU				C-5A		81		1.5	
							82		0.6	
2784	AFSATCOM	C	ARC-171	156	B-52G		79		63.3	
							80		14.3	
							81		1.7	
							82	33	1.6	
							83	14	0.5	
				82	B-52H		79		63.3	
							80		14.3	
							81		1.7	
							82	15	1.6	
							83	3	0.5	
				41	FB-111A		79		20.5	
							80		0.2	
							81		0.5	
							82	19	0.4	
							83	7	0.2	
2784	AFSATCOM	C	ASC-19	156	B-52G		79		63.3	
							80		14.3	
							81		1.7	
							82	38	1.6	
							83	14	0.5	
				82	B-52H		79		63.3	
							80		14.3	
							81		1.7	
							82	15	1.6	
							83	3	0.5	
				41	FB-111A		79		20.5	
							80		0.2	
							81		0.5	
							82	19	0.4	
							83	7	0.2	
2848	VOR/ILS	N	ARN-127	280	F-4C		79		31.5	HAYES OO-ALC/MMSPM 458-5436
							80		0.6	ROBINSON WR-ALC/MMIMC 468-3675
							81	280	1.1	
							82	0	1.1	
							83	2	0.3	
							84	2	0.1	

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	FUNDS	POINT OF CONTACT DEC 82
2343	VOR/ILS	N	APN-127	230	F-4C		85	3	0.1	
							86	0	0.0	
				462	F-4D		79		31.5	ROBINSON WR-ALC/MMIMC 468-3675
							80		0.6	
							81	461	1.1	
							82	3	1.1	
							83	0	0.3	
							84	0	0.1	
							85	0	0.1	
				661	F-4E		79		31.5	
							80		0.6	
							81	620	1.1	
							82	51	1.1	
							83	17	0.3	
							84	0	0.1	
							85	0	0.1	
				344	RF-4C		79		31.5	ROBINSON WR-ALC/MMIMC 468-3675
							80		0.6	
							81	343	1.1	
							82	2	1.1	
							83	1	0.3	
							84	0	0.1	
							85	0	0.1	
2871	IMPR IR SYS	TA/S	AAD-5	330	RF-4C		79		69.3	
							80		0.1	
							81	324	10.2	
							82	10	23.5	
							83	11	0.2	
							84	1	0.0	
2900	CHAFF DISPENSER	EC	ALE-40	234	F-4D		79	0	14.5	MAHER OO-ALC/MMSPM 458-5965
							80		3.5	WITTENBURG ASD/AEWS 785-2665
							81		2.8	
							82	82	1.2	
							83	94	1.4	
							84	76	1.0	
							85	24	0.3	
							86	13	0.2	
				688	F-4E		79	0	14.5	
							80	0	3.5	
							81		2.8	
							82	1	1.2	
							83	2	1.4	
							84	0	1.0	
							85	0	0.3	
							86	0	0.2	
2907	616A MODEM AN/AR	C	ARC-96	8	EC-135C		79		9.8	
							80		8.0	

NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	EQUIPMENT INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
2907	616A MODEM AN/AR	C	ARC-96	8	EC-135C		81		0.3		C
							82	4	0.4		
							83	5	0.3		
2916	AVTR		TA/S A-AVTR	20	F-4D	TAF 322-75	77	0	5.0	KLEMTOWSKI	ASD/RWRS 735-2503
							78	0	1.7	NAYLOR	OO-ALC/MMSPM 458-5436
							79	0	9.6	O'GUINN	WR-ALC/MMIMF 468-3271
							80		0.1	SHOFFNER	TAC/DRAV 432-7965
							81		0.6		
							82	13	2.2		
							83	33	4.7		
							84	14	1.9		
							85	22	0.6		
							86	9	0.3		
				53	F-4E	TAF 322-75	79	0	15.3	KLEMTOWSKI	ASD/RWRS 735-2503
							80		0.1	NAYLOR	OO-ALC/MMSPM 458-5436
							81		0.6	O'GUINN	WR-ALC/MMIMF 468-3271
							82	32	2.2	SHOFFNER	TAC/DRAV 432-7965
							83	134	4.7		
							84	61	1.9		
							85	0	0.6		
							86	0	0.3		
				53	F-4G	TAF 322-75	79	0	15.3	KLEMTOWSKI	ASD/RWRS 735-2503
							80		0.1	O'GUINN	WR-ALC/MMIMF 468-3271
							81		0.6	SHOFFNER	TAC/DRAV 432-7965
							82	50	2.2		
							83	44	4.7		
							84	11	1.9		
							85	0	0.6		
							86	0	0.3		
2916A	AVTR MAV				F-4D		80		0.0		
							81	26	0.2		
							82	24	0.6		
							83	34	0.9		
							84	21	0.6		
							85	34	1.0		
							86	11	0.3		
2917	PAVE TACK	N	ARN-101	166	F-4E	TAC 12-72	77		78.4	NORTHAM	OC-ALC/MMSR 458-6164
							78		27.1	PERKINS	OC-ALC/MMSPM 458-5436
							79		14.9		
							80		9.4		
							81		8.8		
							82	20	3.5		
							83	1	0.6		
				58	RF-4C	TAC 12-72	77	0	78.4	HAMILTON	TAC/DRAV 432-7965
							78	0	27.1		
							79	0	14.9		
							80	0	9.4		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
2917	PAVE TACK	N	ARN-101	58	RF-4C		81		8.8		
							82	12	3.5		
							83	5	0.6		
2917A	AVTR				F-4E		80	113	1.0		
							81	63	1.1		
							82	50	1.3		
							83	51	1.3		
							84	24	0.7		
							85	11	0.0		
							86	15	0.0		
							87	11	0.0		
					RF-4C		80	47	1.0		
							81	35	1.1		
							82	12	1.3		
							83	13	1.3		
							84	1	0.7		
2923	TAIL WARNING SYS	EC	ALQ-153	64	B-52G	SAC 23-69	79		65.3	JONES	OC-ALC/MMHHA 735-3573
							80		22.3	WIMBERLY	WR-ALC/MMRMS 468-5804
							81		19.3		
							82	38	18.1		
							83	40	14.0		
							84	39	2.0		
							85	27	1.4		
							86	0	0.0		
				37	B-52H	SAC 23-69	79		65.3	JONES	OC-ALC/MMHHA 735-3573
							80		22.3	WIMBERLY	WR-ALC/MMRMS 468-5804
							81		19.3		
							82	23	18.1		
							83	22	14.0		
							84	22	2.0		
							85	14	1.4		
							86	0	0.0		
2930S	INSTALL ALQ-119	EC	ALQ-119	65	F-111E		80		0.0		
							81		0.1		
							82	20	0.1		
							83	4	0.0		
							84	1	0.0		
2952	COMPASS TIE	EC	ALR-69	67	F-4D	TAC 31-68	78	0	6.1	CRIDDLE	OO-ALC 458-5436
							79	0	38.2	PERRY	OO-ALC/MMSRH 458-4137
							80		1.3		
							81	4	0.0		
							82	63	10.5		
							83	130	14.5		
							84	0	1.0		
							85	0	8.9		
							86	0	0.0		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
2952	COMPASS TIE	EC	ALR-69	67	F-4D		87	0	0.2		
2957	RADAR RECEIVER	EC	ALR-62	32	F-111A		78	0	16.5	BAYARD	SM-ALC/MMKREM 633-2590
							79	0	76.9	DORNING	SM-ALC/MMSREF 633-2542
							80	0	37.6	MALONEY	ASD/RWRW 785-3143
							81		0.4		
							82	46	2.7		
							83		1.8		
							84	0	0.4		
							85	0	0.3		
							86	0	0.0		
				21	F-111D		78	0	16.5	BROWN	SM-ALC/MMKREF 633-2452
							79	0	76.9	DORNING	SM-ALC/MMSREF 633-2542
							80	0	37.6		
							81		0.4		
							82	18	2.7		
							83	20	1.8		
							84	21	0.4		
							85	19	0.3		
							86	1	0.0		
				61	F-111E		78	0	16.5	BAYARD	SM-ALC/MMKREM 633-2590
							79	0	76.9		
							80	0	37.6		
							81		0.4		
							82	60	2.7		
							83	17	1.8		
							84	0	0.4		
							85	0	0.3		
							86	0	0.0		
							87	36	0.0		
				48	F-111F		78	0	16.5	DORNING	SM-ALC/MMKREF 633-2542
							79	0	76.9	PEREZ	SM-ALC/MMKREM 633-2590
							80	0	37.6		
							81		0.4		
							82	45	2.7		
							83	43	1.8		
							84	1	0.4		
							85	0	0.3		
							86	0	0.0		
				41	FB-111A		78	0	16.5		
							79	0	76.9		
							80	0	37.6		
							81		0.4		
							82	19	2.7		
							83	7	1.8		
							84	0	0.4		
							85	0	0.3		
							86	0	0.0		
2960	INSTALL ALQ-137	EC	ALQ-137	55	FB-111A		79		60.7		

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT		
2960	INSTALL ALQ-137	EC	ALQ-137	55	FB-111A		80		25.8			
							81		3.8			
							82	19	1.0			
							83	7	0.4			
2970	ECM TRANSMTR UPD	EC	ALT-23	121	B-52G	SAC 8-75	79		27.3	MITCHELL	OC-ALC/MMHHM	735-3573
							80		15.5	WIMBERLY	WR-ALC/MMRMS	468-5804
							81		17.6			
							82	38	7.7			
							83	39	0.8			
							84	10	0.2			
				69	B-52H	SAC 8-75	79		27.3	MITCHELL	OC-ALC/MMHHM	735-3573
							80		15.5	WIMBERLY	WR-ALC/MMRMS	468-5804
							81		17.6			
							82	23	7.7			
							83	21	0.8			
							84	5	0.2			
2973	ECM PW MGT	EC	ALQ-155	121	B-52G	SAC 3-74	79		46.3	MITCHELL	OC-ALC/MMHHM	735-3573
							80		20.5	WIMBERLY	WR-ALC/MMRMS	468-5804
							81		24.2			
							82	38	12.6			
							83	39	2.7			
							84	10	0.7			
				69	B-52H	SAC 3-74	79		46.3	MITCHELL	OC-ALC/MMHHM	735-3573
							80		20.5	WIMBERLY	WR-ALC/MMRMS	468-5804
							81		24.2			
							82	23	12.6			
							83	21	2.7			
							84	5	0.7			
2974	PAVE TACK	TA/S	AVQ-26	0	F-4E		79	0	23.9			
							80	0	1.3			
							81	0	0.0			
							82	0	0.0			
							83	0	0.0			
							84	167	0.0			
				54	RF-4C		79		23.9			
							80		1.3			
							81	35	0.0			
							82	19	0.0			
							83	7	0.0			
							84	0	0.0			
							85	0	0.0			
							86	0	0.0			
							87	0	0.0			
							88	0	0.0			
							89	6	0.0			
2981	FLARE/CHAFF DISP	EC	ALE-40	172	A-7D		79		7.1	LEWIS	OC-ALC/MMSF	735-3547

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
2981	FLARE/CHAFF DISP	EC	ALE-40	172	A-7D		80		2.0		
							81		3.7		
							82	94	2.3		
							83	77	1.8		
							84	53	1.4		
							85	40	1.0		
2984	INS	N	C-IV-E	0	EC-135B		79	0	66.6		
							80	0	20.6		
							81	0	3.9		
							82	0	1.7		
							83	2	0.2		
				10	EC-135C		79		66.6	EATON	OC-ALC/MMIMI 735-3980
							80		20.6		
							81		3.9		
							82	4	1.7		
							83	1	0.2		
				0	EC-135K		79	0	66.6	EATON	OC-ALC/MMIMI 735-3980
							80	0	20.6		
							81	0	3.9		
							82	0	1.7		
							83	1	0.2		
				2	EC-135N		79		66.6	EATON	OC-ALC/MMIMI 735-3980
							80		20.6		
							81		3.9		
							82	4	1.7		
							83	1	0.2		
2998	F-5E UPDATE MOD	ID	APX-101	73	F-5E		80	0	0.0	ROBINSON	WR-ALC/MMIMC 468-3675
							81	15	0.2		
							82	59	1.3		
							83	23	0.5		
2998	F-5E UPDATE MOD	N	ARN-127	73	F-5E		80	0	0.0	ROBINSON	WR-ALC/MMIMC 468-3675
							81	15	0.2		
							82	59	1.3		
							83	23	0.5		
2998	F-5E UPDATE MOD	CD	MXU-553	73	F-5E		80	0	0.0	ROBINSON	WR-ALC/MMIMC 468-3675
							81	15	0.2		
							82	59	1.3		
							83	23	0.5		
3004	ALE-40 FLARE SYS	EC	ALE-40	0	C-130E		81	0	0.0	EUBANKS	WR-ALC/MMSF 468-6475
							82	0	0.0	SMITH	MAC/XPQS 638-3303
							83	0	1.9		
							84	0	4.8		
							85	3	8.0		
							86	10	5.4		
							87	42	0.0		

NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
3004	ALE-40 FLARE SYS	EC	ALE-40	0	C-130E		88	94	0.0		
							89	129	0.0		
				0	C-130H		81	0	0.0	SMITH	MAC/XP2S 638-3908
							82	0	0.0		
							83	0	1.9		
							84	0	4.8		
							85	2	8.0		
							86	0	5.4		
							87	0	0.0		
							88	31	0.0		
							89	59	0.0		
3008	FLARE CHAFF DISP	EC	AWE-FCD	4	A-10A		80		0.1	JOCHIM	SM-ALC/MMSPEF 633-2452
							81		0.1	ROBINSON	ASD/TAXA 785-4135
							82	39	1.8		
							83	46	2.6		
							84	16	0.9		
							85	28	1.6		
3010	ALR-56 RWR UPDAT	EC	ALR-56	0	F-15A	TAC 9-68	79	0	1.8	BLAND	WR-ALC/MMA-1 468-6176
							80	0	4.4	BRUCE	ASD/TAPB 785-4112
							81		6.1	REED	ASD/TAFA 785-2003
							82		2.9		
				0	F-15B	TAC 9-68	79	0	1.8	BLAND	WR-ALC/MMA-1 468-6176
							80	0	4.4	BRUCE	ASD/TAPB 785-4112
							81		6.1	REED	ASD/TAFA 785-2003
							82		2.9		
				0	F-15C	TAC 9-68	79	0	1.8	BLAND	WR-ALC/MMA-1 468-6176
							80	0	4.4	BRUCE	ASD/TAPB 735-4112
							81		6.1	REED	ASD/TAFA 785-2003
							82		2.9		
3011	EHANCED UPD-4 SL	RE	UPD-4	1	RF-4C		78	0	8.4	BISHOP	OO-ALC/MMSRH 458-4133
							79	0	6.5	WASIL	ASD/RWRW 785-3015
							80	0	15.9		
							81	0	3.5		
							82	1	6.2		
							83	4	0.2		
							84	12	0.4		
							85	1	0.1		
3013	PAVE TRACK	TA/S	AVQ-26	73	F-111F	TAF 332-72	78	0	14.8	PEREZ	SM-ALC/MMKREM 633-2590
							79	0	30.1	STANLEY	TAC/DRAV 432-7965
							80		29.6		
							81		14.3		
							82	31	3.2		
							83	22	2.5		
							84		0.0		
3015	TAC SUPPORT AIRC				EF-111A	TAF 315-73	79	15	25.3	ABBOTT	TAC/DRWS 432-4883

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
3015	TAC SUPPORT AIRC				EF-111A		80	0	7.9	SAGE	SM-ALC/MMKREF 633-2452 C
							81		43.4		
							82	3	48.3		
							83	12	52.0		
							84	15	71.5		
							85		0.0		
							86		0.0		
3022	ALCM				B-52G	SAC 12-76	79	0	23.2	GUTTMAN	ASD/YYHP 735-2904
							80	28	65.4	MAULDIN	OC-ALC/MMHH 735-5369
							81	1	12.2		
							82	26	87.7		
							83	40	148.7		
							84	36	467.9		
							85	0	413.1		
							86	0	123.5		
							87	2	67.8		
							88	0	2.1		
					B-52H		79	0	23.2		
							80	0	65.4		
							81	0	12.2		
							82	0	87.7		
							83	0	148.7		
							84	1	467.9		
							85	17	413.1		
							86	23	123.5		
							87	22	67.8		
							88	23	2.1		
							89	10	0.0		
3023	OAS CMI	SI	AP-101C	29	B-52G	SAC 6-75	79	0	30.8	BRANHAM	ASD/YYH 785-2567
							80		350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81	1	304.4		
							82	26	296.3		
							83	40	328.1		
							84	40	235.2		
							85	39	22.2		
							86	24	14.8		
							87	0	0.0		
				14	B-52H	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80	0	350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81		304.4	SIZEMORE	WR-ALC/MMIMD 468-3287
							82	12	296.3		
							83	22	328.1		
							84	23	235.2		
							85	21	22.2		
							86	16	14.8		
							87	0	0.0		
3023	OAS CMI	N	APN-218	29	B-52G	SAC 6-75	79	0	30.8	BRANHAM	ASD/YYH 785-2567

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
3023	OAS CMI	N	APN-218	29 B-52G		80		350.5	GAMMILL	OC-ALC/MMHH 735-5369
						81	1	304.4		
						82	26	296.3		
						83	40	328.1		
						84	40	235.2		
						85	39	22.2		
						86	24	14.8		
						87	0	0.0		
				14 B-52H	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
						80	0	350.5	GAMMILL	OC-ALC/MMHH 735-5369
						81		304.4	SIZEMORE	WR-ALC/MMIMD 468-3287
						82	12	296.3		
						83	22	328.1		
						84	23	235.2		
						85	21	22.2		
						86	16	14.8		
						87	0	0.0		
3023	OAS CMI	N	APN-224	29 B-52G	SAC 6-75	79	0	30.8	BRANHAM	ASD/YYH 785-2567
						80		350.5	GAMMILL	OC-ALC/MMHH 735-5369
						81	1	304.4		
						82	26	296.3		
						83	40	328.1		
						84	40	235.2		
						85	39	22.2		
						86	24	14.8		
						87	0	0.0		
				14 B-52H	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
						80	0	350.5	GAMMILL	OC-ALC/MMHH 735-5369
						81		304.4	SIZEMORE	WR-ALC/MMIMD 468-3287
						82	12	296.3		
						83	22	328.1		
						84	23	235.2		
						85	21	22.2		
						86	16	14.8		
						87	0	0.0		
3023	OAS CMI	SI	ASK-7	29 B-52G	SAC 6-75	79	0	30.8	BRANHAM	ASD/YYH 785-2567
						80		350.5	GAMMILL	OC-ALC/MMHH 735-5369
						81	1	304.4		
						82	26	296.3		
						83	40	328.1		
						84	40	235.2		
						85	39	22.2		
						86	24	14.8		
						87	0	0.0		
				14 B-52H	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
						80	0	350.5	GAMMILL	OC-ALC/MMHH 735-5369
						81		304.4	SIZEMORE	WR-ALC/MMIMD 468-3287
						82	12	296.3		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
3023	OAS CMI	SI	ASK-7	14	B-52H		83	22	328.1		
							84	23	235.2		
							85	21	22.2		
							86	16	14.8		
							87	0	0.0		
3023	OAS CMI	CD	ASN-134	29	B-52G	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80		350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81	1	304.4		
							82	26	296.3		
							83	40	328.1		
							84	40	235.2		
							85	39	22.2		
							86	24	14.8		
							87	0	0.0		
				14	B-52H	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80	0	350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81		304.4	SIZEMORE	WR-ALC/MMIMD 468-3287
							82	12	296.3		
							83	22	328.1		
							84	23	235.2		
							85	21	22.2		
							86	16	14.8		
							87	0	0.0		
3023	OAS CMI	N	ASN-136	29	B-52G	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80		350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81	1	304.4		
							82	26	296.3		
							83	40	328.1		
							84	40	235.2		
							85	39	22.2		
							86	24	14.8		
							87	0	0.0		
				14	B-52H	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80	0	350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81		304.4	SIZEMORE	WR-ALC/MMIMD 468-3287
							82	12	296.3		
							83	22	328.1		
							84	23	235.2		
							85	21	22.2		
							86	16	14.8		
							87	0	0.0		
3023	OAS CMI	CD	ASQ-175	29	B-52G	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80		350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81	1	304.4		
							82	26	296.3		
							83	40	328.1		
							84	40	235.2		

NUMBER	TITLE	FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
3023	OAS CMI	CD	ASQ-175	29	B-52G		85	39	22.2		
							86	24	14.8		
							87	0	0.0		
				14	B-52H	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80	0	350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81		304.4	SIZEMORE	WR-ALC/MMIMD 468-3287
							82	12	296.3		
							83	22	328.1		
							84	23	235.2		
							85	21	22.2		
							86	16	14.8		
							87	0	0.0		
3023	OAS CMI	CD	ASQ-176	29	B-52G	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80		350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81	1	304.4		
							82	26	296.3		
							83	40	328.1		
							84	40	235.2		
							85	39	22.2		
							86	24	14.8		
							87	0	0.0		
				14	B-52H	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80	0	350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81		304.4	SIZEMORE	WR-ALC/MMIMD 468-3287
							82	12	296.3		
							83	22	328.1		
							84	23	235.2		
							85	21	22.2		
							86	16	14.8		
							87	0	0.0		
3023	OAS CMI	SI	AYK-17	29	B-52G	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80		350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81	1	304.4		
							82	26	296.3		
							83	40	328.1		
							84	40	235.2		
							85	39	22.2		
							86	24	14.8		
							87	0	0.0		
				14	B-52H	SAC 6-75	79	0	80.8	BRANHAM	ASD/YYH 785-2567
							80	0	350.5	GAMMILL	OC-ALC/MMHH 735-5369
							81	.	304.4	SIZEMORE	WR-ALC/MMIMD 468-3287
							82	12	296.3		
							83	22	328.1		
							84	23	235.2		
							85	21	22.2		
							86	16	14.8		
							87	0	0.0		

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$		POINT OF CONTACT DEC 82
3025	VINSON SECURE VO C	KY-58	0	AC-130A		83	1	0.4	RIDEG	MAC/XPQS 638-3908
						84	0	2.3		
						85	6	3.1		
						86	3	2.2		
						87	0	0.6		
						88	0	0.0		
			0	AC-130H		83	1	0.4	RIDEG	MAC/XPQS 638-3908
						84	1	2.3		
						85	6	3.1		
						86	2	2.2		
						87	0	0.6		
						88	0	0.0		
			0	C-130A	ESC 1-77	83	2	0.4	KIRKLAND	WR-ALC/MMMV 468-6461
						84	32	2.3	RIDEG	MAC/XPQS 638-3908
						85	43	3.1		
						86	38	2.2		
						87	3	0.6		
						88	0	0.0		
			0	C-130B	ESC 1-77	83	3	0.4	KIRKLAND	WR-ALC/MMMV 468-6461
						84	27	2.3	RIDEG	MAC/XPQS 638-3908
						85	32	3.1		
						86	25	2.2		
						87	6	0.6		
						88	0	0.0		
			0	C-130D	ESC 1-77	83	1	0.4	RIDEG	MAC/XPQS 638-3908
						84	3	2.3		
						85	3	3.1		
						86	2	2.2		
						87	0	0.6		
						88	0	0.0		
			0	C-130E	ESC 1-77	83	3	0.4	RIDEG	MAC/XPQS 638-3908
						84	87	2.3		
						85	79	3.1		
						86	71	2.2		
						87	36	0.6		
						88	1	0.0		
						89	0	0.0		
			0	C-130H	ESC 1-77	83	3	0.4	RIDEG	MAC/XPQS 638-3908
						84	20	2.3		
						85	42	3.1		
						86	14	2.2		
						87	13	0.6		
						88	0	0.0		
						89	0	0.0		
			0	C-141B	ESC 1-77	82	0	1.5	RIDEG	MAC/XPQS 638-3908
						83	2	2.9		
						84	79	5.4		
						85	144	2.9		
						86	44	0.9		

NUMBER	MODIFICATION TITLE	EQUIPMENT FUN NOMENCLATURE INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	
3025	VINSON SECURE VO C	KY-58	0 C-5A	ESC 1-77	82	0	2.0	KIRKLAND	WR-ALC/MMMV 468-6461 C
					83	2	2.0	RIDEG	MAC/XPQS 638-3908
					84	1	4.7		
					85	37	0.5		
					86	37	0.5		
					87	0	0.0		
			0 EC-130E		83	2	0.4		
					84	1	2.3		
					85	4	3.1		
					86	3	2.2		
					87	1	0.6		
					88	0	0.0		
			6 F-4C		82	0	0.0		
					83	6	0.2		
					84	74	1.0		
					85	53	1.1		
					86	83	1.3		
					87	24	0.9		
					88	0	0.3		
			0 F-4D		82	0	0.0		
					83	43	0.2		
					84	99	1.0		
					85	98	1.1		
					86	98	1.3		
					87	96	0.9		
					88	11	0.3		
			1 F-4E	ESC 1-77	82	1	0.0	KIRKLAND	WR-ALC/MMMV 468-6461
					83	1	0.2		
					84	57	1.0		
					85	121	1.1		
					86	148	1.3		
					87	103	0.9		
					88	74	0.3		
					89	0	0.0		
			0 F-4G		82	0	0.0		
					83	12	0.2		
					84	24	1.0		
					85	23	1.1		
					86	24	1.3		
					87	24	0.9		
					83	0	0.3		
			0 HC-130H	ESC 1-77	83	1	0.4	KIRKLAND	WR-ALC/MMMV 468-6461
					84	3	2.3	RIDEG	MAC/XPQS 638-3908
					85	15	3.1		
					86	5	2.2		
					87	0	0.6		
					88	0	0.0		
					89	1	0.0		
			0 HC-130N	ESC 1-77	83	1	0.4	RIDEG	MAC/XPQS 638-3908
					84	5	2.3		

NUMBER	MODIFICATION TITLE	EQUIPMENT FUN NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
3025	VINSON SECURE VO C	KY-58	0	HC-130N		85	6	3.1		
						86	3	2.2		
						87	0	0.6		
						88	0	0.0		
			0	HC-130P	ESC 1-77	83	0	0.4	RIDEG	MAC/XPQS 638-3908
						84	6	2.3		
						85	5	3.1		
						86	7	2.2		
						87	0	0.6		
						88	0	0.0		
			4	RF-4C		82	4	0.0		
						83	27	0.2		
						84	71	1.0		
						85	59	1.1		
						86	84	1.3		
						87	63	0.9		
						88	29	0.3		
			0	WC-130E	ESC 1-77	83	1	0.4	RIDEG	MAC/XPQS 638-3908
						84	2	2.3		
						85	3	3.1		
						86	0	2.2		
						87	0	0.6		
						88	0	0.0		
			0	WC-130H	ESC 1-77	83	1	0.4	RIDEG	MAC/XPQS 638-3908
						84	3	2.3		
						85	6	3.1		
						86	4	2.2		
						87	0	0.6		
						88	0	0.0		
3033	SKE ENHANCEMENT			C-130B	MAC 310-74	83		2.1	SCHESINGER	MAC/XPQS 638-3908
						84		20.8		
						85		27.1		
						86		17.4		
				C-130E	MAC 310-74	83		2.1	SCHESINGER	MAC/XPQS 638-3908
						84		20.8		
						85		27.1		
						86		17.4		
				C-130H	MAC 310-74	83		2.1	SCHESINGER	MAC/XPQS 638-3908
						84		20.8		
						85		27.1		
						86		17.4		
				C-141B	MAC 1-78	82		21.3	SCHESINGER	MAC/XPQS 638-3908
					MAC 5-80	83		13.8		
						84		6.2		
3035	CTVS/AVTR	TA/S A-CTVS/AVTR	0	F-15A	TAF 312-77	81	0	5.8	BLAND	WR-ALC/MMA-1 468-6176
					TAF 322-75	82		0.0	KLEMTOWSKI	ASD/RWRS 785-2503
						83		3.5	O'QUINN	WR-ALC/MMIMF 468-3271
						84		0.0	SHOFFN[illegible]	TAC/DRAV 432-7965

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	
3035	CTVS/AVTR	TA/S	A-CTVS/AVTR	0	F-15A		85		0.0		
							86		0.0		
							87		0.0		
							88		0.0		
							89		0.0		
				0	F-15B	TAF 312-77	81	0	5.8	BLAND	WR-ALC/MMA-1 468-6176
						TAF 322-75	82		0.0	KLEMTOWSKI	ASD/RWRS 735-2503
							83		3.5	O'QUINN	WR-ALC/MMIMF 468-3271
							84		0.0	SHOFFNER	TAC/DRAV 432-7965
							85		0.0		
							86		0.0		
							87		0.0		
							88		0.0		
							89		0.0		
				0	F-15C	TAF 312-77	81	0	5.8	BLAND	WR-ALC/MMA-1 468-6176
						TAF 322-75	82		0.0	KLEMTOWSKI	ASD/RWRS 735-2503
							83		3.5	O'QUINN	WR-ALC/MMIMF 468-3271
							84		0.0	SHOFFNER	TAC/DRAV 432-7965
							86		0.0		
							87		0.0		
							88		0.0		
							89		0.0		
				0	F-15D	TAF 312-77	81	0	5.8	BLAND	WR-ALC/MMA-1 468-6176
						TAF 322-75	82		0.0	KLEMTOWSKI	ASD/RWRS 735-2503
							83		3.5	O'QUINN	WR-ALC/MMIMF 468-3271
							84		0.0	SHOFFNER	TAC/DRAV 432-7965
							85		0.0		
							86		0.0		
							87		0.0		
							88		0.0		
							89		0.0		
3044	E-4A TO B CONV				E-4A	SAC QOR	80	0	124.8	RIGSBY	OC-ALC/MMZA 735-5661
							81	1	136.5		
							82	1	158.4		
							83	2	93.2		
							84	0	0.0		
							85	0	0.0		
3048	INS 975	N	ASN-141	0	A-10A	USAF 7-76	81	0	28.8	CRAIG	ASD/AEAC 735-5859
							82	0	28.6	SHAVER	TAC/DRFG 432-5331
							83	0	59.9		
							84	59	58.2		
							85	58	5.0		
							86	51	8.0		
							87	31	2.5		
3050	100KW XMITTER	C	ARC-96	8	EC-135C	SAC 7-71	83		13.8	FORD	WR-ALC/MMIMF 468-3271
							84		0.0		
							85		0.0		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
3050	100KW XMITTER	C	ARC-96	2	EC-135H	SAC 7-71	83		13.8	FORD	WR-ALC/MMIMF 468-3271 C
							84		0.0		
							85		0.0		
				2	EC-135J		83		13.8		
							84		0.0		
							85		0.0		
				0	EC-135P	SAC 7-71	83		13.8	FORD	WR-ALC/MMIMF 468-3271
							84		0.0		
							85		0.0		
3060	ADP				E-4B		81	1	3.9		
							82	1	0.0		
							83	0	5.0		
							84	1	2.9		
							85	2	0.0		
3063	PARKHILL SECURE	C	KY-75	0	AC-130A		83	1	0.1		
							84	0	1.7		
							85	6	2.4		
							86	3	1.6		
							87	0	0.5		
							88	0	0.0		
				0	AC-130H		83	1	0.1		
							84	1	1.7		
							85	6	2.4		
							86	2	1.6		
							87	0	0.5		
							88	0	0.0		
				0	C-130A	ESC 1-77	83	2	0.1	KIRKLAND	WR-ALC/MMMV 468-6461
							84	32	1.7	RIDEG	MAC/XPQS 638-3908
							85	43	2.4		
							86	38	1.6		
							87	3	0.5		
							88	0	0.0		
				0	C-130B	ESC 1-77	83	3	0.1	KIRKLAND	WR-ALC/MMMV 468-6461
							84	27	1.7	RIDEG	MAC/XPQS 638-3908
							85	33	2.4		
							86	25	1.6		
							87	6	0.5		
							88	0	0.0		
				0	C-130D	ESC 1-77	83	2	0.1	RIDEG	MAC/XPQS 638-3908
							84	3	1.7		
							85	3	2.4		
							86	2	1.6		
							87	0	0.5		
							88	0	0.0		
				0	C-130E	ESC 1-77	83	3	0.1	RIDEG	MAC/XPQS 638-3908
							84	87	1.7		
							85	79	2.4		
							86	71	1.6		

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
3063	PARKHILL SECURE	C	KY-75	0	C-130E		87	35	0.5		
							88	1	0.0		
							89	0	0.0		
				0	C-130H	ESC 1-77	83	3	0.1	RIDEG	MAC/XPQS 638-3908
							84	20	1.7		
							85	42	2.4		
							86	14	1.6		
							87	13	0.5		
							88	0	0.0		
							89	0	0.0		
				0	C-141B	ESC 1-77	82	0	1.4	KIRKLAND	WR-ALC/MMMV 468-6461
							83	2	2.8	RIDEG	MAC/XPQS 638-3908
							84	79	4.5		
							85	144	1.4		
							86	44	0.4		
				0	C-5A	ESC 1-77	82	0	1.6	KIRKLAND	WR-ALC/MMMV 468-6461
							83	2	3.4	RIDEG	MAC/XPQS 638-3908
							84	1	4.9		
							85	37	0.4		
							86	37	0.4		
							87	3	0.0		
				0	EC-130E		83	2	0.1		
							84	1	1.7		
							85	4	2.4		
							86	3	1.6		
							87	1	0.5		
							88	0	0.0		
				0	HC-130H		83	1	0.1	RIDEG	MAC/XPQS 638-3908
							84	3	1.7		
							85	15	2.4		
							86	5	1.6		
							87	0	0.5		
							88	0	0.0		
							89	1	0.0		
				0	HC-130N		83	1	0.1	RIDEG	MAC/XPQS 638-3908
							84	5	1.7		
							85	6	2.4		
							86	3	1.6		
							87	0	0.5		
							88	0	0.0		
				0	HC-130P		83	0	0.1	RIDEG	MAC/XPQS 638-3908
							84	6	1.7		
							85	5	2.4		
							86	6	1.6		
							87	0	0.5		
							88	0	0.0		
				3	RF-4C		82	3	0.0		
							83	27	0.4		
							84	72	1.1		
							85	59	0.9		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
3063	PARKHILL SECURE	C	KY-75	3	RF-4C		86	83	1.3		
							87	64	1.0		
							88	29	0.5		
				0	WC-130E		83	1	0.1	RIDEG	MAC/XPQS 638-3908
							84	2	1.7		
							85	3	2.4		
							86	0	1.6		
							87	0	0.5		
							88	0	0.0		
				0	WC-130H		83	1	0.1	RIDEG	MAC/XPQS 638-3908
							84	3	1.7		
							85	6	2.4		
							86	4	1.6		
							87	0	0.5		
							88	0	0.0		
3064	UHF RADIO	C	HAVE QUICK	0	A-10A	TAF 321-75	80	0	16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81	0	24.8	MCCREA	TAC/DRCG 432-3951
							82	0	0.0		
							83		10.7		
							84		9.0		
				0	A-7D	TAF 321-75	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	MCCREA	TAC/DRCG 432-3951
							82		0.0		
							83		0.0		
							84		0.0		
				0	C-130B	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		
							83		0.0		
							84		0.0		
				0	C-130D	MAC 203-30	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		
							83		0.0		
							84		0.0		
				0	C-130E	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		
							83		0.0		
							84		0.0		
				0	C-130H	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		
							83		0.0		
							84		0.0		
				0	C-141B	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		
							83		0.0		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
3064	UHF RADIO	C	HAVE QUICK	0	C-141B		84		0.0		
				0	C-5A		80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPJS 638-3903
				0	C/NC-141A	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7		
							82		0.0		
							83		0.0		
							84		0.0		
				0	CH-53C	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPJS 638-3903
							82		0.0		
							83		0.0		
							84		0.0		
				0	E-3A	TAF 321-75	82	19	0.3	JOHNSON	WR-ALC/MMIMC 468-3675
							83	12	0.2	MCCREA	TAC/DRCG 432-3951
							84	3	0.1		
				0	EF-111A		80	0	16.1		
							81	0	24.8		
							82	0	0.0		
							83	42	10.7		
							84	0	9.0		
				24	F-111A	TAF 321-75	80	0	16.1	BAYARD	SM-ALC/MMKREM 633-2590
							81	0	24.8	JOHNSON	WR-ALC/MMIMC 468-3675
							82	24	0.0	MCCREA	TAC/DRCG 432-3951
							83	26	10.7		
							84	0	9.0		
				24	F-111D	TAF 321-75	80	0	16.1	BROWN	SM-ALC/MMKREF 633-2452
							81	0	24.8	JOHNSON	WR-ALC/MMIMC 468-3675
							82	24	0.0	MCCREA	TAC/DRCG 432-3951
							83	57	10.7		
							84	0	9.0		
3064	HAVE QUICK BYPAS	C	HAVE QUICK	0	F-15A	TAF 321-75	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		0.0	MCCREA	TAC/DRCG 432-3951
							82		3.8		
							83		0.0		
							84		0.0		
				0	F-15B	TAF 321-75	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		0.0	MCCREA	TAC/DRCG 432-3951
							82		3.8		
							83		0.0		
							84		0.0		
				0	F-15C	TAF 321-75	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		0.0	MCCREA	TAC/DRCG 432-3951
							82		3.8		
							83		0.0		
							84		0.0		
				0	F-15D	TAF 321-75	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		0.0	MCCREA	TAC/DRCG 432-3951
							82		3.8		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
3064	HAVE QUICK BYPAS	C	HAVE QUICK	0	F-15D		83		0.0		C
							84		0.0		
3064	UHF RADIO	C	HAVE QUICK	0	F-16A			0	0.0	MCCREA	TAC/DRCG 432-3951
						TAF 321-75		0	0.0	JOHNSON	WR-ALC/MMIMC 468-3675
				0	F-16B	TAF 321-75		0	0.0	JOHNSON	WR-ALC/MMIMC 468-3675
								0	0.0	MCCREA	TAC/DRCG 432-3951
				0	F-4D	TAF 321-75	80	0	16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81	0	21.7	MCCREA	TAC/DRCG 432-3951
							82	0	0.0		
							83		0.0		
							84		0.0		
				0	F-4E	TAF 321-75	80	0	16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81	0	21.7	MCCREA	TAC/DRCG 432-3951
							82	0	0.0		
							83		0.0		
							84		0.0		
				0	F-4G	TAF 321-75	80	0	16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81	0	21.7	MCCREA	TAC/DRCG 432-3951
							82	0	0.0		
							83		0.0		
							84		0.0		
				0	HC-130H	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		
							83		0.0		
							84		0.0		
				0	HC-130N	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		
							83		0.0		
							84		0.0		
				0	HC-130P	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		
							83		0.0		
							84		0.0		
				0	HH-3E		80		16.1	RIDEG	MAC/XPQS 638-3908
							81		21.7		
							82		0.0		
							83		0.0		
							84		0.0		
				0	HH-53B	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		
							83		0.0		
							84		0.0		
				0	HH-53C	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
3064	UHF RADIO	C	HAVE QUICK	0	HH-53C		83		0.0		
							84		0.0		
				0	HH-53H	MAC 203-80	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	RIDEG	MAC/XPQS 638-3908
							82		0.0		
							83		0.0		
							84		0.0		
				0	OV-10A	TAF 321-75	80		16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81		21.7	MCCREA	TAC/DRCG 432-3951
							82		0.0		
							83		0.0		
							84		0.0		
				0	RF-4C	TAF 321-75	80	0	16.1	JOHNSON	WR-ALC/MMIMC 468-3675
							81	0	21.7	MCCREA	TAC/DRCG 432-3951
							82	0	0.0		
							83		0.0		
							84		0.0		
3067	DIVRSTY RCPTN EQ				EC-135A		85		5.6		
							86		27.1		
							87		22.8		
					EC-135B		85		5.6		
							86		27.1		
							87		22.8		
					EC-135C		85		5.6		
							86		27.1		
							87		22.8		
					EC-135G		85		5.6		
							86		27.1		
							87		22.8		
					EC-135H		85		5.6		
							86		27.1		
							87		22.8		
					EC-135J		85		5.6		
							86		27.1		
							87		22.8		
					EC-135K		85		5.6		
							86		27.1		
							87		22.8		
					EC-135L		85		5.6		
							86		27.1		
							87		22.8		
					EC-135N		85		5.6		
							86		27.1		
							87		22.8		
					EC-135P		85		5.6		
							86		27.1		
							87		22.8		
3070	NUC HARD/SEC VOI	C	KY-58	0	EC-135A	ESC 1-77	81	0	11.8	KIRKLAND	WR-ALC/MMMV 468-6461

MODIFICATION NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	DEC 82
3070	NUC HARD/SEC VOI	C	KY-58	0	EC-135A		82	0	8.5		
							83		0.0		
							84	5	0.7		
				0	EC-135C	ESC 1-77	81	0	11.8	KIRKLAND	WR-ALC/MMMV 468-6461
							82	0	8.5		
							83	0	0.0		
							84	14	0.7		
				0	EC-135G	ESC 1-77	81	0	11.8	KIRKLAND	WR-ALC/MMMV 468-6461
							82	0	8.5		
							83	0	0.0		
							84	4	0.7		
				0	EC-135H	ESC 1-77	81	0	11.8	KIRKLAND	WR-ALC/MMMV 468-6461
							82	0	8.5		
							83	0	0.0		
							84	5	0.7		
				0	EC-135J	ESC 1-77	81	0	11.8	KIRKLAND	WR-ALC/MMMV 468-6461
							82	0	8.5		
							83	0	0.0		
							84	4	0.7		
				0	EC-135L	ESC 1-77	81	0	11.8	KIRKLAND	WR-ALC/MMMV 468-6461
							82	0	8.5		
							83	0	0.0		
							84	5	0.7		
				0	EC-135P	ESC 1-77	81	0	11.8	KIRKLAND	WR-ALC/MMMV 468-6461
							82	0	8.5		
							83	0	0.0		
							84	2	0.7		
3070	V/P SECURE VOICE	C	KY-58	0	F-111A		82	0	0.1		
							83	0	0.0		
							84	0	0.0		
							85	3	0.1		
							86	6	0.7		
							87	13	3.4		
							88	27	1.1		
				0	F-111D		82	0	0.1		
							83	0	0.0		
							84	0	0.0		
							85	2	0.1		
							86	11	0.7		
							87	62	3.4		
							88	8	1.1		
				0	F-111E		82	0	0.1		
							83	0	0.0		
							84	0	0.0		
							85	1	0.1		
							86	10	0.7		
							87	29	3.4		
							88	14	1.1		
							89	0	0.0		

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82
3070	V/P SECURE VOICE	C	KY-58	0	F-111F		82	0	0.1	
							83	0	0.0	
							84	0	0.0	
							85	1	0.1	
							86	11	0.7	
							87	71	7.4	
							88	10	1.1	
							89	0	0.0	
				0	OV-10A		80	0	1.0	
							81	0	0.9	
							82	0	0.0	
							83	1	7.5	
							84	73	0.1	
							85	4	14.2	
							86	0	11.9	
							87	0	6.6	
3070	NUC HARD/SEC VOI	C	KY-75	0	EC-135A	ESC 1-77	81	0	11.8	KIRKLAND WR-ALC/MMMV 463-6461
							82	0	8.5	
							83		0.0	
							84	5	0.7	
				0	EC-135C	ESC 1-77	81	0	11.8	KIRKLAND WR-ALC/MMMV 463-6461
							82	0	8.5	
							83	0	0.0	
							84	14	0.7	
				0	EC-135G	ESC 1-77	81	0	11.8	KIRKLAND WR-ALC/MMMV 463-6461
							82	0	8.5	
							83	0	0.0	
							84	4	0.7	
				0	EC-135H	ESC 1-77	81	0	11.8	KIRKLAND WR-ALC/MMMV 463-6461
							82	0	8.5	
							83	0	0.0	
							84	5	0.7	
				0	EC-135J	ESC 1-77	81	0	11.8	KIRKLAND WR-ALC/MMMV 463-6461
							82	0	8.5	
							83	0	0.0	
							84	4	0.7	
				0	EC-135L	ESC 1-77	81	0	11.8	KIRKLAND WR-ALC/MMMV 463-6461
							82	0	8.5	
							83	0	0.0	
							84	5	0.7	
				0	EC-135P	ESC 1-77	81	0	11.8	KIRKLAND WR-ALC/MMMV 463-6461
							82	0	8.5	
							83	0	0.0	
							84	2	0.7	
3070	V/P SECURE VOICE	C	KY-75	0	F-111A		82	0	0.1	
							83	0	0.0	
							84	0	0.0	
							85	3	0.1	

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82
3070	V/P SECURE VOICE C		KY-75	0	F-111A		86	6	0.7	
							87	13	3.4	
							88	27	1.1	
				0	F-111D		82	0	0.1	
							83	0	0.0	
							84	0	0.0	
							85	2	0.1	
							86	11	0.7	
							87	62	3.4	
							88	3	1.1	
				0	F-111E		82	0	0.1	
							83	0	0.0	
							84	0	0.0	
							85	1	0.1	
							86	10	0.7	
							87	29	3.4	
							88	14	1.1	
							89	0	0.0	
				0	F-111F		82	0	0.1	
							83	0	0.0	
							84	0	0.0	
							85	1	0.1	
							86	11	0.7	
							87	71	3.4	
							88	10	1.1	
							89	0	0.0	
				0	OV-10A		80	0	1.0	
							81	0	0.9	
							82	0	0.0	
							83	1	3.5	
							84	73	0.1	
							85	4	14.2	
							86	0	11.9	
							87	0	6.6	
3070S	V/P SECURE VOICE C		KY-75	0	FB-111A		82	0	0.1	
							83	0	0.0	
							84	0	0.0	
							85	0	0.0	
							86	1	0.0	
							87	16	0.2	
							88	46	0.9	
3084	F-111E AMAC				F-111E		83		5.1	
3087	AMAC				B-52G		82		17.7	KILBURN OC-ALC/MMHH 735-5373
							83		8.0	
					B-52H		82		17.7	
							83		8.0	
3088	RWR	EC	ALR-74	0	F-4E		82		8.5	

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82
3083	RWR	EC	ALR-74	0	F-4E		83		47.2	C
							84		64.0	
							85		53.1	
							86		48.2	
							87		0.0	
							88		0.0	
							89		0.0	
3089	AMAC				FB-111A		82		8.3	
3104	CAVR				F-5E		83	1	0.7	
							84	0	0.0	
							85	1	0.0	
							86	100	0.0	
3112	MK XII IFF IMPRO ID		APX-MXII	0	A-10A		83		1.7	
							84		0.6	
				0	F-15A		83		3.1	
							84		2.3	
				0	F-15B		83		3.1	
							84		2.3	
				0	F-15C		83		3.1	
							84		2.3	
				0	F-15D		83		3.1	
							84		2.3	
				0	F-16A		85		0.9	
							86		2.3	
				0	F-16B		85		0.9	
							86		2.3	
				0	F-4E		84		2.6	
							85		2.7	
				0	F-4G		84		2.6	
							85		2.7	
				0	RF-4C		84		2.6	
							85		2.7	
3128	BLOCK 20/25 IMPR				E-3A		82		12.9	
							83		126.4	
							84		153.8	
							85		92.5	
36068C	MKII INS	N	AJN-15	0	F-111D		81	0	3.9	
							82	0	0.0	
							83	83	0.0	
				0	F-111F		81	0	3.9	
							82	0	0.0	
							83	93	0.0	
				0	FB-111A		81	0	3.9	
							82	0	0.0	
							83	63	0.0	

NUMBER	MODIFICATION TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
390433	EF-111A MOD UPDA				F-111A		79		2.5		
							80		0.2		
							81	2	0.3		
							82	8	0.3		
							83	12	0.4		
							84	15	0.5		
41652B	STD DIG ADC	SI	SCADC	0	A-7D		85		30.5		
							86		41.2		
							87		47.5		
							88		33.2		
							89		23.4		
				0	A-7K		85		30.5		
							86		41.2		
							87		47.5		
							88		33.2		
							89		23.4		
				0	C-141B		85		30.5	MINNICK	MAC/LGMA 638-2059
							86		41.2		
							87		47.5		
							88		33.2		
							89		23.4		
				0	C-5A		85		30.5	MINNICK	MAC/LGMA 638-2059
							86		41.2		
							87		47.5		
							88		33.2		
							89		23.4		
				0	C/NC-141A		85		30.5		
							86		41.2		
							87		47.5		
							88		33.2		
							89		23.4		
				0	EF-111A		85		30.5		
							86		41.2		
							87		47.5		
							88		33.2		
							89		23.4		
				0	F-111A		85		30.5		
							86		41.2		
							87		47.5		
							88		33.2		
							89		23.4		
				0	F-111D		85		30.5		
							86		41.2		
							87		47.5		
							88		33.2		
							89		23.4		
				0	F-111E		85		30.5		
							86		41.2		

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR SCHEDULE	$	POINT OF CONTACT DEC 82
416523	STD DIG ADC	SI	SCADC	0	F-111E		87	47.5	
							88	33.2	
							89	23.4	
				0	F-111F		85	30.5	
							86	41.2	
							87	47.5	
							88	33.2	
							89	23.4	
				0	F-4C		85	30.5	
							86	41.2	
							87	47.5	
							88	33.2	
							89	23.4	
				0	F-4D		85	30.5	
							86	41.2	
							87	47.5	
							88	33.2	
							89	23.4	
				0	F-4E		85	30.5	
							86	41.2	
							87	47.5	
							88	33.2	
							89	23.4	
				0	F-4G		85	30.5	
							86	41.2	
							87	47.5	
							88	33.2	
							89	23.4	
				0	FB-111A		85	30.5	
							86	41.2	
							87	47.5	
							88	33.2	
							89	23.4	
				0	KC-135A		85	30.5	
							86	41.2	
							87	47.5	
							88	33.2	
							89	23.4	
				0	KC-135D		85	30.5	
							86	41.2	
							87	47.5	
							88	33.2	
							89	23.4	
				0	KC-135Q		85	30.5	
							86	41.2	
							87	47.5	
							88	33.2	
							89	23.4	
				0	NKC-135A		85	30.5	
							86	41.2	

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT
416523	STD DIG ADC	SI	SCADC	0	NKC-135A		87		47.5	
							88		33.2	
							89		23.4	
				0	RF-4C		85		30.5	
							86		41.2	
							87		47.5	
							88		33.2	
							89		23.4	
420059	EVS FLIR DSP	TA/S	ASQ-151	0	B-52G		84		13.9	
							85		12.2	
							86		11.3	
				0	B-52H		84		13.9	
							85		12.2	
							86		11.3	
438463	AMPLFR REPLC				A-7D		81		4.0	
							82		3.5	
					A-7K		81		4.0	
							82		3.5	
532593	AYDIN DISP SYS				HH-3E		82		0.4	
					HH-53B		82		0.4	
					HH-53C		82		0.4	
					HH-53H		82		0.4	
591139	COMP/DISK DRIVE				HH-53B		82		0.4	
					HH-53C		82		0.4	
					HH-53H		82		0.4	
591143	COMP/DISK DRIVE				HH-3E		82		0.4	
600673	INSTL APN-59E RA	N	APN-59E	0	C-130A		82	0	0.4	THEOBALD MAC/LGMA 638-2059
							83	2	0.5	
							84	8	0.2	
							85	0	0.0	
610653	AVQ-30 REPLACEMT	N	AVQ-30XX	0	E-3A		83		1.9	
							84		2.2	
61U001	IMPROVED COMM/NA				F-15A		81	0	9.7	
							82	0	13.6	
							83	3	16.9	
							84	95	16.0	
							85	111	8.5	
							86	79	6.4	
							87	43	2.7	
					F-15B		81	0	9.7	
							82	0	13.6	
							83	3	16.9	

NUMBER	MODIFICATION TITLE	FUN	EQUIPMENT NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	YR	SCHEDULE	$	POINT OF CONTACT	
61U001	IMPROVED COMM/NA				F-15B		84	21	16.0		
							85	26	8.5		
							86	7	6.4		
							87	1	2.7		
					F-15C		81	0	9.7		
							82	0	13.6		
							83	2	16.9		
							84	23	16.0		
							85	29	8.5		
							86	62	6.4		
							87	0	2.7		
					F-15D		81	0	9.7		
							82	0	13.6		
							83	1	16.9		
							84	10	16.0		
							85	9	8.5		
							86	7	6.4		
							87	0	2.7		
621453	RWR LRU-3 TEST	EC	ALR-56	0	F-15A		84		2.1		
				0	F-15B		84		2.1		
				0	F-15C		84		2.1		
				0	F-15D		84		2.1		
63025C	REPLC TACAN	N	APN-119	0	C-5A		82	0	4.2		SA-ALC/MMSS 945-6206
							83	36	0.0	ROBINSON	WR-ALC/MMIMC 468-3675
							84	40	0.0		
630983	COMM/NAV UPDATE	N	ADF-60	1	C-140A		80	0	2.1	BERTHOLD	WR-ALC/MMSL 468-2635
							81	1	0.3	ERWIN	MAC/LGMA 638-2059
							82	1	0.1		
							83	2	0.3		
630983	COMM/NAV UPDATE	C	AIC-13	1	C-140A		80	0	2.1	BERTHOLD	WR-ALC/MMSL 468-2635
							81	1	0.3	ERWIN	MAC/LGMA 638-2059
							82	1	0.1		
							83	2	0.3		
630983	COMM/NAV UPDATE	C	ARC-136	1	C-140A		80	0	2.1	BERTHOLD	WR-ALC/MMSL 468-2635
							81	1	0.3	ERWIN	MAC/LGMA 638-2059
							82	1	0.1		
							83	2	0.3		
630983	COMM/NAV UPDATE	FL	FCS-80	1	C-140A		80	0	2.1	BERTHOLD	WR-ALC/MMSL 468-2635
							81	1	0.3	ONODERA	MAC/LGMA 638-2059
							82	1	0.1		
							83	2	0.3		
630983	COMM/NAV UPDATE	CD	FD-35	1	C-140A		80	0	2.1	BERTHOLD	WR-ALC/MMSL 468-2635
							81	1	0.3	ONODERA	MAC/LGMA 638-2059

MODIFICATION NUMBER	TITLE	EQUIPMENT FUN	NOMENCLATURE	INS	AIRCRAFT	REQUIREMENT	SCHEDULE/FUNDS YR	SCHEDULE	$	POINT OF CONTACT DEC 82	
680983	COMM/NAV UPDATE	CD	FD-35	1	C-140A		82	1	0.1		
							83	2	0.3		
630983	COMM/NAV UPDATE	N	VOR-ILS	1	C-140A		80	0	2.1	BERTHOLD	WR-ALC/MMSL 468-2635
							81	1	0.3	ERWIN	MAC/LGMA 638-2059
							82	1	0.1		
							83	2	0.3		
630983	COMM/NAV UPDATE	N	WXR-30C	1	C-140A		80	0	2.1	BERTHOLD	WR-ALC/MMSL 468-2635
							81	1	0.3	STURM	MAC/LGMA 638-2059
							82	1	0.1		
							83	2	0.3		
69023A	EMERG LOC XMITTE	C	ELT	207	C-141B		79	0	0.5	BERRIDGE	MAC/XPDS 638-3908
							80	0	0.0	COLLINS	WR-ALC/MMSPGM 468-2767
							81	16	0.2		
							82	223	1.0		
							83	13	0.1		
				18	C/NC-141A		79		0.5	COLLINS	WR-ALC/MMSPGM 468-2767
							80		0.0		
							81	4	0.2		
							82	14	1.0		
							83	2	0.1		

ANNEX D

Compendium of Related Plans

This appendix provides a listing of Air Force plans that are related to the avionics area or address programs which are common to the avionics area. This compendium is divided into specific functional areas to enable grouping of related plans. Each plan is identified by title, Office of Primary Responsibility (OPR), AUTOVON Number, Classification, and Date of Plan. This compendium will be continually updated by the Deputy for Avionics Control.

A detailed compendium with summary descriptions of each of these plans which includes the purpose, format, and publication frequency is available upon request. Requests for this compendium or changes, addition, and/or corrections to this appendix should be forwarded to Mr. George H. Baum, ASD/AXPP, WPAFB OH 45433; AUTOVON 785-5694, Commercial (513) 255-5694.

TITLE	OPR	AUTOVON NUMBER	CLASSIFICATION	DATE OF PLAN
ARMAMENT				
Aircraft Armament Interoperability Interface Program (A^2 I^2) Joint Management Plan	AFAL, Eglin AFB FL		Unclassified	Apr 79
Air Force Armament Laboratory Research & Technology Plan FY 83-87 (RCS-DLX-(A)-7402)	AFAL, Eglin AFB FL		Unclassified	Sep 81
Air Force Armament Laboratory Technical Objective Document, AFATL-TR-80-26	AFAL, Eglin AFB FL		Unclassified	Feb 80
B-1B Nuclear Certification Planning Document	ASD/B-1B		Unclassified	Jan 82
GAU-8, 30MM Close Air Support Gun Program Memorandum	USAF/RDQRM		Confidential	Mar 76
Nonnuclear Armament Plan	AD/CRP	872-4711	Secret/ NOFORN	Dec 81
AVIONICS GENERAL				
AFWAL Integrated Controls Initiative Government/Industry Kickoff Meeting	AFWAL		Unclassified	Apr 81

TITLE	OPR	AUTOVON NUMBER	CLASSIFICATION	DATE OF PLAN
Air Standardization Coordinating Committee Planning Data Package	ASD/ENAS	785-5025	Unclassified	Mar 82
AFLC Program Objective Memorandum (POM)	AFLC/XRP	787-6322	Secret	Dec 81
Armament and Avionics Planning Guidance	ASD/AXP	785-5694	Unclassified	Dec 81
Avionics Planning Baseline	ASD/AXP	785-5694	Unclassified	Apr 81
F-15 Multi-Stated Improvement Plan (MSIP)	ASD/TAF	785-3111	Unclassified	80
Flight Simulators	ASD/YWB	785-6889	Unclassified	Aug 81
Integrated Strike Avionics Study (ISAS)	AFWAL/AART-3	785-3765	Secret/ NOFORN	Nov 80
Mark XII Technical Improvement Program (TIP) Program Management Plan (PMP)	ASD/AEAC	785-5859	Secret	Jul 80
NAVAIR Avionics Master Plan	NAVAIR		Unclassified	Mar 81
Standard, Medium Accuracy Navigator Program Management Plan	ASD/AEA	785-6611	Unclassified	Rev Nov 79
Standard, Medium Accuracy Navigator Program (Annex A, A-10 Application) Program Management Plan	ASD/AEA	785-6611	Unclassified	Jul 81
USAF Armament and Avionics Planning Report to Industry	ASD/AXP	785-5694	Unclassified	May 81
USAF-RDT&E Budget Estimate Submission (BES)	USAF/RDXR	227-7169	Secret/ NOFORN	Sep 82
USAF-RDT&E Program Objective Memorandum (POM)	USAF/RDXR	227-7169	Secret/ NOFORN	Jun 82

TITLE	OPR	AUTOVON NUMBER	CLASSI-FICATION	DATE OF PLAN
COMMAND, CONTROL, COMMUNICATION (C^3)				
Anti-Jam Communication Implementation Plan	ESD/TCY	478-4934	Secret	Nov 81
Command and Control and Comunication (C^3) Program Plan	ESD/XRV	479-5980 Mitre 7228	Secret	Oct 81
Joint Master Plan Threat for Jam Resistant Single Channel Voice Radio Communications	USAF/INEG	297-4137	Secret	Jul 79
USAF Command Control and Communications Program Plan	USAF/XOK	225-4440	Secret	Nov 81
ELECTRONIC WARFARE				
Electromagnetic Combat Action Plan	USAF/XOE		Secret/ NOFORN	Apr 81
Electronic Countermeasures (ECM) Directory	AFEWS/ESRC	945-2057	Secret/ NOFORN	Nov 81
USAF Supplemental Program - Electronic Warfare (EW)	USAF/PRTFC	227-6276	Secret	Subsequent to POM & BES
INFORMATION SYSTEMS				
Embedded Computer Resources Standardization Plan	DMSSO (Def. Matl. Spec. & Stds Off)	289-2343	Unclassified	Oct 81
Standard Central Air Data Computer Program Management Plan	ASD/AFA	785-6611	Unclassfield	Sep 81
Tactical Air Forces Integrated Information System (TAFIIS) Master Plan	TAFIG/IIAC	432-5396	Secret/ NOFORN	Sep 80
MODIFICATIONS				
A-10 Long-Range Requirements	ASD/TAX	785-3259	Unclassified	Apr 81

TITLE	OPR	AUTOVON NUMBER	CLASSI- FICATION	DATE OF PLAN
F-16 Weapon System Master Modification Plan	ASD/YPC	785-3906	Secret	Nov 81
Multinational Staged Improvement Program (MSIP)	ASD/YP	785-6151	Unclassi-	Mar 81
ASD Test and Evaluation Workload Forecast	ASD/AWB	785-3486	UNCLASS	Sep 81
Global Force Projection	ASD/XR	785-5646	Secret/ NOFORN	Oct 80
Integrated Mission Area Analysis (IMA)	ASD/TA	785-6973	Unclassi- fied	Jan 82
MAC Forces and Projects	HQ MAC/ACM		Unclassi- fied	Nov 8
Standard Fuel Savings Advisory System Program Management Plan	ASD/AEA	785-6611	Unclassi- fied	Jan 79
Vanguard Planning Summary	AFSC/XRP	858-5347	Secret	Sep 81
F-15 Master Program Schedule	ASD/TAPP	785-4009	Unclassi- fied	Jan 82
RADAR				
USAF Airborne Radar Technology (ART) Plan	ASD/XRY	785-6614	Secret/ NOFORN	Jul 78
RECONNAISSANCE				
Reconnaissance Sensors/Processing Technology Program Plan	AFWAL/AARI	785-5922	Secret/ NOFORN	May 80
THREAT ASSESSMENTS				
Adaptive HF/VHF Communications	ESD/INK	478-2783	Secret/ NOFORN	Aug 80
Airborne Self-Protection Jammer (ASPJ)	NISC-OOW	763-2289	Secret/ NOFORN/ WNINTEL	Sep 80

TITLE	OPR	AUTOVON NUMBER	CLASSI-FICATION	DATE OF PLAN
AN/ALQ-165 Airborne Self-Protection Jammers (ASPJ) Joint Threat Assessment	NISA-OOW	763-2289	Secret/ NOFORN WNINTEL	Sep 80
Project Close Look II	HQ MAC/XPQ	638-4431	Secret	Feb 80
Defense Communications Under Stress - Comstress Phase II Report	Def. Comm. Agency	222-6799	Secret/ NOFORN	Sep 80
Threat to E-4B Airborne Command Post	ESD/INK	478-2783	Secret/ NORFORN/ WNINTEL	Jul 79
Electromagnetic Combat Action Plan Threat Environment Description	FTD/TQI	787-4751	Secret/ NOFORN/ WNINTEL	Aug 80
F-4G Advanced Wild Weasel Threat Assessment	FTD/TQI	787-4751	Secret/ NOFORN WNINTEL	Mar 81
Threat for the Joint Tactical Communications (TRITAC) Program	Joint Tactical Comm. Off.	992-8382	Secret/ NOFORN/ WNINTEL	Apr 79
Joint Tactical Information Distribution System (JTIDS) Threat Assessment	ESD/INK	478-2783	Secret/ NOFORN/ WNINTEL	Oct 80
Threat Assessment Report for the Long-Range Berlin Radar Replacement Study	ESD/INK	478-2783	Secret/ NOFORN/ WNINTEL	Apr 80
Pave Mover System Threat Assessment Report	ESD/INK	478-2783	Secret/ NOFORN/ WNINTEL	Jan 81
Precision Location Strike System (PLSS) Electronic Warfare Threat Through 1990	DIA/DT4C (Def. Intell. Agency)	224-2744	Secret/ NOFORN WNINTEL	Sep 77
Seek Talk System Threat Assessment Report	ESD/ONK ESD/ INK	478-2783	Secret/ NOFORN/ WNINTEL	Nov 80
Soviet Ground Forces Electromagnetic Environment	AFIS/OL-N	945-2645	Secret/ NOFORN/ WNINTEL	Mar 81
U.S. Identification System (NATO Identification System (Subset) Threat Definition	ASD/AEI	785-2891	Secret/ WNINTEL	Apr 80

ANNEX E

LIST OF ACRONYMS, ABBREVIATIONS, AND CODE NAMES

Annex E lists general acronyms, abbreviations, and code names used in the Avionics Master Plan.

AA	Air Armament Working Party (Under NATO MAS)
A/A	Air-to-air
AAA	Advanced Airlift Aircraft, Antiaircraft Artillery
AAPC	Armament and Avionics Planning Conference
AAPG	Armament and Avionics Planning Guidance
AASF	Advanced Air Superiority Fighter
ABIT	Airborne Imagery Transmission
ABN	Airborne
A/C	Aircraft
ACIP	Avionics Communications and Information Processing
ACMA	Advanced Civil Military Aircraft
ACMI	Airborne Combat Maneuvering Instrumentation
AD	Armament Division (AFSC)
ADA	Advanced Digital Avionics
ADAS	Auxiliary Data Annotation Set
ADC	Air Data Computer
ADCOM	Air Defense Command
ADF	Automatic Direction Finder
ADGINT	Advanced Global Positioning System (GPS) Inertial Integration
ADM	Advanced Development Model
ADP	Automated Data Processing; Advanced Development Program
ADRES	Advanced Reconnaissance Sensor
ADTC	Previously Armament Development Test Center (Eglin AFB, FL), now Armament Division
ADUS	Avionics Date Utilization System
ADWC	Air Defense Weapons Center; Tyndall AFB, FL
AE	Air Electrical Working Party (Under NATO MAS)
AEB	Avionics Equipment Bay
AEEC	Airlines Electronic Engineering Committee
AEW	Airborne Early Warning
AFAL	Air Force Avionics Laboratory; WPAFB, OH
AFALD	Air Force Acquisition Logistics Division; WPAFB, OH
AFC	Automatic Flight Control
AFETR	Air Force Eastern Test Range
AFEWES	Air Force Electronic Warfare Evaluation Simulator (General Dynamics-F-16)
AFFTC	Air Force Flight Test Center; Edwards AFB, CA
AFISC	Air Force Inspection and Safety Center (Norton AFB, CA)
AFLC	Air Force Logistics Command; WPAFB, OH
AFPG	Air Force Planning Guide
AFR	Air Force Reserve; Air Force Regulation

AFSATCOM	Air Force Satellite Communications (System)
AFSC	Air Force Systems Command; Andrews AFB, MD
AFTI	Advanced Fighter Technology Integration
AFWAL	Air Force Wright Aeronautical Laboratory; WPAFB, OH
AFWMAA	Air Force Wide Mission Area Analysis
AFWWMCCS	Air Force World Wide Military Command and Control System
A/G	Air-to-Ground
AGILE	Counter-Insurgency and Limited Conflict R & D Program
AHARS	Attitude Heading and Reference System
AI	Aircraft Instruments and Aircrew Station Working Party (Under NATO MAS)
AI	Air Intercept
AIDS	Advanced Integrated Display System
AIL	Avionics Integration Laboratory (Boeing - E-3A)
AIMS	ATCRBS, Identification, Mark XII System
AIPD	Airborne Intercept Pulse Doppler
AIS	Avionics Intermediate Shop
AISF	Avionics Integration Support Facility
ALC	Air Logistics Center
ALCM	Air Launched Cruise Missile
ALSS	Advanced Location Strike System
AM	Amplitude Modulation
AMAS	Automated Maneuvering Attack System
AMECON	Division of Litton Industries
AMLS	Advanced Military Landing System
AMP	Avionics Master Plan; Aircraft Modernization Program
AMRAAM	Advanced Medium Range Air-to-Air Missile
ANSI	American National Standards Institute
APB	Avionics Planning Baseline
APG	Aberdeen Proving Ground
APMS	Advanced Power Management System
APSE	Ada Programming Support Environment
ARIA	Advanced Range Instrumentation Aircraft
ARINC	Aeronautical Radio, Inc.
ART	Airborne Radar Technology (USAF Plan)
A/S	Air-to-Surface
ASA	Advanced System Avionics
ASARS	Advanced Synthetic Aperture Radar System
ASCC	Air Standardization Coordination Committee
ASD	Aeronautical Systems Division; WPAFB, OH
ASD/XR	Aeronautical Systems Division, Deputy for Development Planning
ASIF	Avionics Software Integration Facility
ASIT	Adaptable Surface Interface Terminal
ASPJ	Airborne Self-Protection Jammer
ASRAT	Advanced Strike Radar Technology
ATAC	Advanced Targeting and Command
ATARS	Advanced Tactical Air Reconnaissance System; Automatic Traffic Advisory and Resolution Service
ATAS	Advanced Tactical Attack System
ATAWS	Autonomous Tactical All-Weather System

ATC	Air Training Command; Randoph AFB, TX
ATCRBS	Air Traffic Control Radar Beacon System
ATD	Advanced Technology Demonstration
ATE	Automated Test Equipment
ATLAS	Abbreviated Test Language for Avionics System
ATPG	Automatic Test Program Generation
AV	Availability
AVCS	Avionics Components and Subsystems
AVS	Avionics Standardization Working Party (Under
AVS	Automated Verification System
	NATO MAS)
AVSAIL	Avionics System Analysis and Integration Laboratory (AFAL)
AVTR	Airborne Video Tape Recorder
AWACS	Airborne Warning and Control System (E-3 Sentry)
AWADS	Adverse Weather Aerial Delivery System
AWSAM	All-Weather Strike Air-to-Air Missile
BAI	Battlefield Air Interdiction
BAR	Broad Area Review
BCAS	Beacon Collision Avoidance System
BES	Budget Estimate Submission
BIT	Built-In-Test
BITE	Built-In-Test Equipment
BNS	Bombing Navigation System
BVR	Beyond Visual Range
BVR-ID	Beyond Visual Range Identification
C	Communications
C^2	Command and Control
C^3CM	Command, Control, and Communications Countermeasures
C^3I	Command Control, Communications, and Intelligence
C^3P2	Command, Control and Communications Program Plan
C^3TPG	Command, Control and Communications Technology Planning Guide
C/A	Counter Air
CADR	Computer Aided Design for Reliability
CADC	Central Air Data Computer
CADSAT	Computer Aided Design and Specification Analysis Tool
CARA	Combined Altitude Radar Altimeter
CAS	Close Air Support, Collision Avoidance System
CCD	Charged Coupled Device
CCEF	Communications Countermeasure Evaluation Facility
CCM	Counter-Counter Measure
C/D	Controls and Displays
C&I	Compatibility and Interoperablity
CDLJ	Communications Data Link Jammer
CDR	Crash Data Recorder, Critical Design Review
CE	Combat Effectiveness
CEFIRO	Countermeasures Evaluation Facilities, Infrared Optical (AFAL)
CEP	Combat Effectiveness Panel
CERT	Combined Environmental Reliability Test

CFE	Contractor Furnished Equipment
CHAMP	Cooperative High Availability Multiprocessor Architecture
CIGTF	Central Inertial Guidance Test Facility
CIP	Communications and Information Processing
CIRIS	Completely Integrated Reference Instrumentation System
CIS	Combat Identification System
CM	Countermeasures
CM/CCM	Countermeasures/Counter-Countermeasures
CMC	Cruise Missile Carrier
CMD	Countermeasures Dispenser Set
CMI	Cruise Missile Integration
CMMR	Common Modular Multimode Radar
CNI	Communication Navigation Identification
CNPI	Communications, Navigation, Positioning, Identification
CO	Core
CO^2	Carbon Dioxide
COMINT	Communications Intelligence
COMM	Communications
COMPSEC	Computer Security Program
COMSEC	Communications Security
CON	Conventional Systms (Flight Control)
CONUS	Continental United States
COOP	Cooperative
COVERT STRIKE	Advanced Development Program Employing Bistatic Radar Concepts
CP	Central Processing Hardware
CPM/P	Command Post Modem/Processor
CPMS	Comprehensive Power Management System
CR	Computer Resources
CRT	Cathode Ray Tube
CSEL	Communications Systems Evaluation Laboratory (AFAL)
CSIS	Combined Sensors/Integrated Subsystems
CSFDR	Crash Survivable Flight Data Recorder
CTA	Companion Trainer Aircraft
CTVS/AVTR	Cockpit TV Sensor/Airborne Video Tape Recorder
CVR	Cockpit Voice Recorder
CW	Continuous Wave
D/A	Dynamic Analyzer (Facility - AFAL)
DABS	Discrete Address Beacon System
DAC	Deputy for Avionics Control
DACS	Data Analysis Center for Software
DAE	Defense Acquisition Executive
DAIS	Digital Avionics Information System
DAR	Data Automation Requirement
DARPA	Defense Advanced Research Projects Agency
DB	Decibel
DCA	Defense Communications Agency
DCAVS	Data Change and Verification Software
DEES	Dynamic Electromagnetic Environment Simulation (AFAL)

DEF	Defense
DEW	Directed Energy Weapon
DE	Direction Finder
D&F	Determination and Findings
DFCS	Digital Flight Control System
DH/RS	Data Handling/Recording System
DL	Data Link
DL/V	Data Loader/Verifier
DME	Distance Measuring Equipment
DMR	Dual Mode Recognition
DMT	Dual Mode Transmitter
DOD, DoD	Department of Defense
DOS	Distributed Operating System
DSARC	Defense System Acquisition Review Council
DSCS	Defense Satellite Communicaton System
DT&E	Development, Test, and Evaluation
D/W	Defense Wide
EAR	Electronically Agile Radar
EC	Electromagnetic Combat
ECAP	Electromagnetic Combat Action Plan
ECCM	Electronic Counter-Countermeasures
ECM	Electronic Countermeasure
ECP	Engineering Change Proposal
ECS	Embedded Computer System; Environmental Control System
ECSPO	Embedded Computer Standardization Program Office
ECTED	Electromagnetic Control Threat Evaluation Document
ED	Exploratory Development
EDE	Electronic Defense Evaluator
EHF	Extremely High Frequency
ELINT	Electronic Intelligence
ELS	Emitter Location System
ELT	Emergency Locator Transmitter
EMC	Electromagnetic Compatibility
EMC/IAP	Electromagnetic Compatibility/Intra-System Analysis Program
EMCAP	Electromagnetic Compatibility Analysis Program
EMCS	Electromagetic Compatibility Standards
EMI	Electromagnetic Interference
EMP	Electromagnetic Pulse
EMR	Electromagnetic Radiation
E-O	Electro-Optical
EOCM	Electro-Optical Countermeasures
EPG	Electronic Proving Ground; Ft. Huachuca, AZ
ERP	Effective Radiated Power
ESAS	Electronically Steerable Antenna System
ESB	Enhanced Strategic Bomber
ESM	Electronic Support Measures
ETF	Enhanced Tactical Fighter
EWAC	Electronic Warfare Anechoic Chamber
EWSAF	Electroic Warfare Simulation Analysis Facility
EWSM	Electronic Warfare Support Measures
EXCOM	Executive Committee of the Armament and Avionics Planning Conference

F^3	Form, Fit, Function (Specification)
FAC	Forward Air Controller
FCP	Fire Control Pod
FD/FI	Fault Detection, Fault Isolation
FET	Field Effect Transistor
FFT	Fast Fourier Transform
FIS	Future Identification System
FL	Flight Control
FLR	Forward Looking Radar
FLIR	Foward Looking Infrared
FOC	Full Operational Capability
FSAS	Flight Management/Fuel Savings Advisory Systems
FSED	Full Scale Engineering Development
FY	Fiscal Year
FYDP	Five Year Defense Plan
GaAs	Gallium Arsenide
GC	Gyro Compass
GEANS	Gimballed Electrostatic Aircraft Navigation System
GFE	Government Furnished Equipment
GLADIS	Ground Laser Designator/Identification System
GOR	General Operational Requirement
GPC	General Purpose Computer
GPSE	Global Positioning System Evaluator
HARA	High Altitude Radar Altimeter
HAVE NOTE	EMR Test Facilities Program
HAVE QUICK	Near-term Jam-Resistance Capability Program for UHF Communications
HEL	High Energy Laser
HF	High Frequency
HMD	Helmet Mounted Display
HOL	Higher Order Language
HWD	Hill-Wendover-Dugway Range
IADS	Integrated Air Defense System
IAW	In Accordance With
ICAR	Integrated Cockpit Architecture
ICNIA	Integrated Communications, Navigation, and Identification Avionics
ID	Identification
IDR	Incident Data Recorder
IFAST	Integration Facility for Avionics System Testing
IFD	Integrated Flight Demonstrator
IFDAPS	Integrated Flight Data Processing System
IFFC	Integrated Flight/Fire Control
IFR	Inflight Refueling, Instrument Flight Rules
IIRA	Integrated Inertial Reference Assembly
ILS	Instrument Landing System; Integrated Logistics Support
ILSP	Integrated Logistics Support Plan
I&M	Improvements and Modernization
IMPATT	Impact Avalanche and Transit Time
INS	Inertial Navigation System
INT	Interdiction
IOC	Initial Operational Capability
IR	Infrared
IRCM	Infrared Countermeasures
IRST	Infrared Search and Track

IRT	Independent Review Team
ISF	Integrated Support Facility
ISSS	Integrated Support Software System
JCMC	Joint Crisis Management Capability
JCSM	Joint Chiefs of Staff Memorandum
JINTACCS	Joint Interoperability of Tactical Comand and Control System
JLC	Joint Logistics Commanders
JMENS	Joint Mission Element Need Statement
JOVIAL	Standard Higher Order Language
JRSVC	Jam Resistant Secure Voice Communication
JSRC	Joint Services Review Committee
JTIDS	Joint Tactical Information Distribution System
JUPL	Joint User Prioritized List
KHZ	Kilohertz
KW	Kilowatt
LAD	Laser Acquisition Device
LANTIRN	Low Altitude Navigation and Targeting Infrared System for Night
LARA	Low Altitude Radar Altimeter
LATR	Low Altitude Threat Radar
LCA	Language Control Agent
LCCG	Life Cycle Cost Guarantee
LCOS	Lead Computing Optical Sight
LED	Light-Emitting Diode
LF	Low Frequency
LLLTV	Low Light Level Television
LN	Logistics Need
LORAN	Long Range Navigation
LOS	Line of Sight
LPIR	Low Probability of Intercept Radar
LRCA	Long Range Combat Aircraft
LRU	Line Replaceable Unit
LSCG	Logistics Support Cost Guarantee
LSI	Large Scale Integration
MAA	Mission Area Analysis
MAC	Military Airlift Command
MAJIC	Modular Anti-Jam Integrated Communication
MANTECH	Manufacturing Technology
MARK XII	Designation ofr a Current IFF System
MAS	Military Agency for Standardization (NATO)
MATE	Modular Automatic Test Equipment
MDMS	Mission Data Management Software
MDPS	Mission Data Preparation System
MDS	Mission Design Series
MEECN	Minimum Essential Emergency Communication Network
MEES	Missile End Game Evaluation System
MFBARS	Multi-Function Multiband Airborne Radio System
MFD	Multifunction Displays
MHZ	Megahertz
MILSATCOM	Military Satellite Communications
MLS	Microwave Landing System
MM	Millimeter
MMW	Millimeter Wave
MOB	Mobility, Main Operating Base
MOE	Measures of Effectiveness
MOS	Metal Oxide Semi-Conductor
MRR	Multi-Role Radar
MSIP	Multinational Staged Improvement Program

MTBF	Mean Time Between Failures
MTSS	Moving Target Simulation System
MTTR	Mean Time To Repair
N	Navigation
NATC	Naval Air Test Center; Patuxent Naval Air Station, MD
NATO	North Atlantic Treaty Organization
NAVSTAR	Code Name for GPS
NC	Non-Cooperative
NCA	National Command Authority
NCAA	Non-Nuclear Consummables Annual Analysis
NCTR	Non-Cooperative Target Recognition
NEACP	National Emergency Airborne Command Post
NGT	Next Generation Trainer
NIS	NATO Identification System
NLRGC	Navigation, Launch/Release, Guidance and Control
NRT	Near-Real-Time
NTWS	Next Generation Threat Warning System
NUC	Nuclear
NWC	Naval Weapons Center; China Lake Naval Air Station, CA
OA	Obstacle Avoidance
OAS	Offensive Avionics System
OC-ALC	Oklahoma Air Logistics Center; Tinker AFB, OK
OCM	Optical Countermeasures
OFP	Operational Flight Program
OMB	Office of Management and Budget
OO-ALC	Ogden Air Logistics Center; Hill AFB, UT
OPTINT	Optical Intelligence
OSA	Operational Support Aircraft
OT&E	Operational Test and Evaluation
P^3I	Preplanned Product Improvement
PACCS	Post Attack Command and Control System
PARKHILL	HF Secure Communications
PAVE MOVER	Real Aperture Side-Looking Radar Development Program
PAVE PENNY	Laser System Dependent upon External Sources
PAVE SPIKE	Laser Pod Used for Acquiring/Designating Ground Targets
PAVE TACK	Air Force Improved TAC Bombing System with FLIR/ Laser Ponds
PCO	Procurement Contracting Officer
PDM	Program Decision Memorandum; Program Depot Maintenance
PE	Program Element
PMC	Packaging, Mounting and Cooling
PME	Packaging, Mounting and Environment, Precision Measurement Equipment
PMP	Program Management Plan
PMTC	Pacific Missile Test Center; Point Mugu, CA
POM	Program Objective Memorandum
POS	Position
PPAC	Product Performance Agreement Center
PPBS	Planning, Programming and Budgeting System
PRAM	Productivity, Reliability, Availability, Maintainability

PRETF	Photo Reconnaissance Engineering Test Facility
PRI	Pulse Recurring Interval
PSP	Programmable Signal Processor
PTS	Photogrammetic Target System
QPL	Qualified Products List
R	Radio
RA	Radar
RADC	Rome Air Development Center; Griffiss AFB, NY
RAM	Radar Absorber Material, Random Access Memory
RAYDIST-T	Navy Mobile/Static Navigation System
RCS	Radar Cross Section
R & D	Research and Development
RE	Reconnaissance
RECCE, RECON,	Reconnaissance
REDCAP	Real Time Electromagnetic Digitally Controlled Analyser Processor
RF	Radio Frequency
RFLSI	Radio Frequency Large Scale Integration
RFP	Request for Proposal
RINT	Radiation Intelligence
RIW	Reliability Improvement Warranty
R & M	Reliability and Maintainability
ROC	Required Operational Capability
RPSP	Radar Programmable Signal Processor
RPV	Remotely Piloted Vehicle
RRS	Reconnaissance Reporting System
RSEL	Reference Systems Evaluation Laboratory
RSPL	Radar Signal Processing Laboratory; Recommended Spare Parts List
R/T	Receiver/Transmitter
RWR	Radar Warning Receiver
SA-ALC	San Antonio Air Logistics Center; Kelly AFB, TX
SAC	Strategic Air Command; Offutt AFB, NE
SACDEF	Strategic Avionics Crew Station Design Evaluation Facility
SAEF	System Architecture Evaluation Facility
SAICS	Standard Avionics Integrated Control System
SAM	Surface to Air Missile
SAMTEC	Space and Missile Test Center; Vandenberg AFB, CA
SAR	Synthetic Aperture Radar
SATCOM	Satellite Communications
SAW	Surface Acoustic Wave
SC	Self Contained
SCADC	Standard Central Air Data Computer
SCNS	Self-Contained Navigation System
S/D	Strategic Defense
SE	Support Equipment
SEAD	Suppression of Enemy Air Defenses
SEAFAC	Systems Engineering Avionics Facility
SEEK TALK	Jam Resistant UHF Voice Communication System
SFD	Single Function Displays

SFSAS	Standard Fuel Savings Advisory System
SHF	Super High Frequency
Si	Silicon
SI	System Integration
SIDS	Steller Inertial Doppler System
SIGINT	Signal Intelligence
SINCGARS-V	Single Channel Ground/Airborne Radio System - Very High Frequency
SIOP	Single Integrated Operational Plan
SIS	Stall Inhibit System
SIT	System Integrated Test
SKE	Station Keeping Equipment
SLAR	Side Looking Airborne Radar
SM	System Manager
SM-ALC	Sacramento Air Logistics Center; McClellan AFB, CA
S/M	Survivability/Maintainability
SMS	Stores Management System
SON	Statement of Operational Need
SOW	Statement of Work
SPEC	Specification
SPN	Standard Precision Navigator
SPO	System Program Office
SQ	Squadron
SRAM	Short Range Attack Missile
SRU	Shop Replaceable Unit
SSB	Singleside Band
SSIDT	Solid State Integrated Digital Timer
SSS	Strategic Satellite System
STANAG	Standardization Agreement
STD	Standard
STOL	Short Takeoff and Landing
STRAT DEF	Strategic Defense
STRAT MOB	Strategic Mobility
STRAT OFF	Strategic Offense
SUAWACS	Soviet Union Airborne Warning and Control System
SUPT	Special Undergraduate Pilot Trainer
S/V	Survivability/Vulnerability
SVGC	Secure Voice Global Communications
SW	Executive Software
TA	Terrain Avoidance
TA/S	Target Acquisition/Strike
TAC	Tactical Air Command
TACAN	Tactical Air Navigation
TACCS	Tactical Airborne Command and Control and Surveillance
TACMOB	Tactical Mobility
TACSATCOM	Tactical Satellite Communications
TADIL	Tactical Data Information Link
TAF	Tactical Air Force
TAFIIS	Tactical Air Forces Integrated Information System
TAID	Total Avionics Integration Demonstration
TAIS	Tactical Air Intelligence System
TAWAR	Tactical All-Weather Attack Requirements
TAWDS	Tactical Acquisition Weapons Delivery System
T/B	Technology Base
TBIRD	Tactical Bistatic Radar Demonstration

TDMA	Time Division Multiple Access
TDV	Target Detection and Validation
T&E	Test and Evaluation
TECH	Technical
TECH MOD	Technology Modernization
TERCOM	Terrain Contour Matching
TEREC	Tactical Electronic Reconnaissance
TEWS	Tactical Electronic Warfare System
TF	Terrain Following
TFG	Tactical Fighter Group
TFR	Terrain Following Radar
TFWC	Tactical Fighter Weapons Center; Nellis AFB, NV
TIAS	Threat Impact Assessment Software
TIC	Technical Interface Concept
TIDP-TE	Technical Interface Design Plan - Test Edition
TME	Total Mission Effectiveness
TN	Technology Needs
TRACALS	Traffic Control Approach and Landing System
TRAM	Target Recognition Attack Multisensor
TRI-TAC	DOD Joint Tactical Communications Program
TRT	TEREC Remote Terminals
TSPI	Time/Space/Position Information
TTB	Tanker Transport Bomber
TTBTS	Tanker-Transport Bomber Aircraft Training System
TWS	Track While Scan
TWT	Traveling Wave Tube
TX/RX	Transmitter/Receiver
U	Micron
UE	User Equipment
UHF	Ultra High Frequency
UHR	Ultra High Resolution
UMTE	Unmanned Threat Emitter
UPT	Undergraduate Pilot Trainer
USA	United States Army
USAF	United States Air Force
USDR & E	Under Secretary of Defense for Research and Engineering
USN	United States Navy
UUT	Unit Under Test
UV	Ultraviolet
VANGUARD	AFSC Planning Initiative
VATS	Video Augmented Tracking System
V/H	Velocity and Height
VHF	Very High Frequency
VHSIC	Very High Speed Integrated Circuits
VINSON	VHF and UHF Secure Communications
VLF	Very Low Frequency
VLSIC	Very Large Scale Integrated Circuits
VOR	Very High Frequency Omnidirectional Range
VSWR	Voltage Standing Wave Ratio
VTOL	Vertical Take-Off and Landing
VTR	Video Tape Recorder
WAAM	Wide Area Anti-Armor Munition
WGETF	Weapons Guidance Engineering Test Facility

WP	Working Party (Under the NATO Military Agency for Standardization (MAS)
WPAFB	Wright-Patterson Air Force Base, OH
WR-ALC	Warner Robins Air Logistics Center; Robins AFB, GA
WSIP	Weapon System Improvement Program
W/W	Wild Weasel
WWMCCS	World Wide Military Command and Control System
WX	Weather
YPG	Yuma Proving Ground

ANNEX F

RELATED REGULATIONS AND STANDARDS/SPECIFICATIONS

This Annex provides a summary of avionics related regulations and standards/specifications that can be used to provide further direction in avionics development and modifications.

REGULATIONS

AFR 57-1, Statement of Operational Need (SON)

AFR 57-4, Modification Program Approval

AFR 65-3, Configuration Management

AFR 80-5, Air Force Reliability and Maintainability Program

AFR 80-14, Test and Evaluation

AFR 80-38, Management of the Air Force Survivability Program

AFR 173-13, USAF Cost and Planning Factors Guide

AFR 178-1, Economic Analysis and Program Evaluation for Resource Management

AFR 800-2, Acquisition Program Management

AFR 800-3, Engineering of Defense Systems

AFR 800-8, Integrated Logistics Support (ILS) Program for Systems and Equipment

AFR 800-11, Life Cycle Cost Management Program

AFR 800-14, Volume 1, Management of Computer Resources in Systems
Volume 2, Acquisition and Support Procedures for Computer Resources in Systems

AFR 800-16, USAF System Safety Program

AFR 800-21, Interim Contractor Support of Systems and Equipment

AFR 800-22, CFE vs GFE Selection Process

AFR 800-28, Air Force Policy on Avionics Acquisition and Support

AFSCR/AFLCR 800-31, Government-Furnished Equipment/Contractor-Furnished Equipment (GFE/CFE) Selection Process, GFE Acquisition and GFE Management

STANDARDS/SPECIFICATIONS

MIL-STD-461A,	Electromagnetic Interference Characteristics, Requirements for Equipment
MIL-STD-462,	Electromagnetic Interference Characteristics, Measurement of
MIL-STD-781C,	Reliability Tests Exponential Distribution
MIL-STD-810C,	Environmental Test Methods
MIL-STD-884C,	Electronically or Optically Generated Displays for Aircraft Control and Combat Cue Information
MIL-STD-1553B,	Aircraft Internal Time Division Command/Response Multiplex Data Bus
MIL-STD-1589A	Jovial J-73 Higher Order Language
MIL-STD-1679,	Weapon System Software Development
MIL-STD-1750A	Sixteen-Bit Computer Instruction Set Architecture
MIL-STD-1760,	Aircraft/Stores Electical Interconnection System
MIL-SPEC-52779,	Software Quality Assurance Program Requirements

ANNEX G

TEST AND SUPPORT CAPABILITIES

This appendix provides summary descriptions of Air Force and selected national test and support facilities. These resources provide a substantial in-house capability for military developers. Program managers should aggressively seek their assistance during development. Contractor facilities are to be used only when Air Force facilities do not exist or cannot be established within program/ schedule/cost contraints.

1. RESEARCH AND DEVELOPMENT

1.1 Integration of Avionics Subsystems

- Systems Engineering Avionics Facility (SEAFAC), ASD/ENASD Wright-Patterson Air Force Base, Ohio, provides a capability to "hot bench" avionics as means to investigate and evaluate alternative avionics system approaches. The facility further acts as ASD's instrument to validate compliance with avionics systems standards, such as MIL-STD-1553B, Aircraft Internal Time Division Command/Response Mulitplex Data Bus, and MIL-STD-1750A, Sixteen-Bit Computer Instruction Set Architecture. In addition, SEAFAC provides for the transition of new technology into ASD, provides for the training and enhancement of the expertise of ASD engineers, and provides a facility for trouble-shooting problems in development systems using MIL-STD-1553B.

- Electromagnetic Compatibility/Intra-System Analysis Program (EMC/IAP) Support Center, Rome Air Development Center (RADC), Griffiss Air Force Base, NY, stores EMC information; in particular aircraft EMC data bases useful for retrofit programs, maintains computerized EMC analysis models such as the Intra-system EMC Analysis Program (EMCAP) and serves as a technology transfer and feedback channel between the Air Force EMC community and the user community.

1.2 Evaluation of Antennas and Electromagnetic Components

- Verona Test Annex, RADC supports engineering and operational testing of electronic Counter-Countermeasure (ECCM), radio interference reduction techniques, radar, communications, millimeter wave research, optical surveillance techniques (lasers), and spatial positioning of test aircraft.

- Stockbridge Test Annex, RADC, is used to make investigative electromagnetic measurements of communications, surveillance, antennas, receivers, and modems, as well as to perform basic studies in ionospheric propagation.

- Newport Test Annex, RADC, measures free space antenna characteristics, including radiation patterns, gain polarization, and Voltage Standing Wave Ratio, (VSWR).

- Ipswich Field Site, Ipswich, Maine, investigates promising electromagnetic techniques leading to novel antennas and antenna scanning systems of potential value to Air Force communications and radar systems.

- Failure Analysis Capability, RADC, conducts in-depth analysis of microelectronic parts and identifies device failure modes and mechanisms.

- Rooftop Satellite Communication (SATCOM) Facility, Air Force Wright Aeronautical Laboratory (AFWAL) Wright-Patterson Air Force Base, Ohio, transmits to the and receives from satellites and is used in simulation, test, and evaluation of experimental satellites' communications equipment and systems.

- Reference Systems Evaluation Laboratroy (RSEL), AFWAL, provides a capability to evaluate hardware and software subsytems of navigation reference systems, both statically and dynamically.

- Dynamic Analyzer Facility (D/A), AFWAL, evaluates the design integrity of R&D and operational sensors and systems under simulated flight conditions, subjecting them to individually or combined programmed and controlled environments.

- Targeting Systems Characterization Facility, AFWAL, exercises and characterizes breadboard or production electrooptical sensors in a fully calibrated atmosphere and under realistic altitude and range conditions against real and synthetic targets. In addition, the facility collects reliable data surrounding the operation of Electro-Optical (EO) devices under various weather conditions to be used for computer models.

- Global Positioning System Evaluator (GPSE) Laboratory, AFWAL, provides a capability for evaluating GPS User Equipment (UE) in real time as prelude, alternative, or extension to flight testing. When completed, this simulation facility will be assigned to ASD and become a part of the SEAFAC to provide all Radio Frequency (RF) analog and digital signals that the UE would require for normal operation.

- Electronic Warface Anechoic Chamber (EWAC), AFWAL, is a chamber with microwave-absorbent material to suppress reflection of RF energy. Entire radar and ECM systems, including antennas, can be exercised uner simulated conditions that otherwise could only be obtained by flight test.

- Laser Radar Reflectivity Range, AFWAL, is an indoor anechoic chamber instrumented for radar backscatter measurements. Within the chamber explaratory development work on aerospace vehicle radar cross section (RCS) reduction, radar absorber materials (RAM), and development and evaluation of new RCS measurement techniques may a performed.

- Countermeasures Evaluation Facility, Infrared-Optical (CEFIRO), AFWAL consists of a 100-foot range to evaluate and compare the spectroradiometric, spatial, and electrical characteristics of electro-optical countermeasures systems components.

- Combined Environmental Reliability Test (CERT) Facility, AFWAL includes two chambers for testing subsystems in realistic mission-profile environments of temperature, humidity, vibration, and altitude. A similar facility is located at Holloman Air Force Base, New Mexico, as part of the Central Inertial Guidance Test Facility (CIGTF).

1.3 Simulation and Analysis

- Communication Systems Evaluation Laboratory (CSEL), AFWAL, assits in the analysis, synthesis, and modeling of military communications and data links by providing a cost-effective means for dynamic evaluation and comparison of advanced communications techniques and systems among satellites, aircraft, and weapons.

- Avionics System Analysis and Integration Laboratory (AVSAIL), AFWAL, uses wide range of simulation tools to evaluate the operation of a complete avionics system, including all subsytem interactions, according to design approaches and mixes that may be varied by the user.

- Radar Signal Processing Laboratory (RSPL), AFWAL, analyzes radar signals in real time. It consists of high-band-width two-dimensional filtering.

- Dynamic Electromagnetic Environment Simulation (DEES), AFWAL, generates a dynamic, multi-signal RF environment for the purpose of testing and evaluating radar homing, warning and electronic intelligence receivers. The DEES along with Electronic Defense Evaluator (EDE) located at the same plae can test and evaluate receiving-jamming closed-loop systems.

- The Real Time Digitally Controlled Analyzer and Processor (REDCAP) Facility is located in Buffalo NY and is operated by Calspan Corporation under Air Force contract. REDCAP is a simulator designed to provide multiple threat scenarios for EW equipment.

- Electronic Defense Evaluator (EDE), AFWAL, is a simulator designed to represent ground-based pulsed radars of the search, track-while-scan, and tracking types for the purpose of evaluating the performance of electronic countermeasure techniques, concepts, and equipment against general threat parameters.

- Air Force Electronic Warfare Evaluation Simulator (AFEWES) is a Government-owned facility located at General Dynamics Government Aircraft Plant No. 4, Ft Worth, Texas. It provides the capability to evaluate ECM equipment through simulation of various EW environments.

- Communications Countermeasures Evaluation Facility (CCEF), AFWAL, is a laboratory capability using specialized test and simulation equipment to determine potential of new research ideas in the area of communication jamming. It allows development of improved jamming techniques and fast-response technical analysis of comm-jamming problems.

- Electronic Warfare Simulation Anaysis Facility (EWSAF), AFWAL, is an in-house facility which provides the capability for effectiveness analysis of EW related problems using resident digital programs and dedicated machines in a classified vaulted area.

2. DEVELOPMENT, TEST AND EVALUATION

2.1 Flight Test Support

- A planned Integration Facility for Avionics Systems Testing (IFAST), 6510th Test Wing (AFSC), Edwards Air Force Base, California, will provide a capaiblity to operate, maintain, test, and evaluate integrated avionics systems during real-time simulated flight with various modes using real-world flight data.

- The current capabilities of 16 DoD ranges to support test requirements for radar, laser designator/ranger, and search track and visual IR imaging systems are summarized in Tables A-1, A-2, and A-3.

- The Air Defense Weapon Center radar test facility at Tyndall Air Force Base, Florida, is capable of Operational Test and Evaluation (OT&E) of pulse Doppler air-to-air fire control and missile radars.

- A planned Moving Target Simulation System (MTSS), 6510 Test Wing (AFSC), Edwards Air Force Base, California, will provide an air-to-ground test capability consisting of remotely controlled ground vehicles (1 to 3) with radar reflectors, which move simultaneously at selectable velocities (5 to 80 knots) through an array of static ground retro-reflectors.

- High Accuracy Multiple Object Tracking System (HAMOTS), 6510 Test Wing (AFSC), Utah Test and Training Range, UT provides a capability for acquisition and collection of Time/Space/Position Information (TSPI) for one or more targets and for real time display of this and other target status information for mission control.

- A planned Integrated Flight Data Processing System (IFDAPS), 6510 Test Wing (AFSC), Edwards Air Force Base, California, will provide more efficient real time and postflight data processing and analysis within the time constraints of air vehicle Developmental Test and Evaluation (DT&E) programs.

2.2 Avionics Integration

- E-3A Avionics Integration Laboratory (AIL), Boeing Aerospace Co., Seattle, Washington, can simulate individual E-3A subsystem inputs. Mission conditions can also be evaluated. Systems can be qualified in accordance with E-3A specifications.

3. MAINTENANCE SUPPORT

3.1 Weapon System Avionics Subsystem Test

- Avionics Unit, Ogden Air Logistics Center, Hill Air Force Base, Utah, provides maintenance support for weapons control systems, communications/ navigation systems, automatic flight control systems and instruments, interial naviagation support equipment and F-16 integrated control systems in support of the F-14 and F-16 weapons systems.

- Radar Calibration Hangeer, Ogden Air Logistics Center, Hill Air Force Base, Utah, supports radar calibration of the weapons control system and radar of the F-4D.

- Electronic Countermeasures Shops, Odgen Air Logistics Center, Hill Air Force Base, Utah, is used to maintain electronic counter-measure and chaff pods.

- 6514 Test Squadron MCCS Shop, Ogden Air Logistics Center, Hill Air Force Base, Utah, acts as a support facility tc maintain equipment used to control AQM-34 unmanned aircraft while in flight.

- 6514 Test Squadron, Sids Doppler Shop, Ogden Air Logisitics Center, Hill Air Force Base, Utah, provides maintenance for the LN162A inertial system and 523 Doppler support of the DC-130, CH-130H and HH-153 helicopters, and AQM-34 unmanned aircraft.

- Photo Reconnaissance Engineering Test Facility (PRETF), Ogden Air Logistics Center, Hill Air Force Base, Utah, is designed to facilitate the following:

    - Testing support for the Photographic Engineering and Reliability Unit of the Item Management Division

    - Failure analysis on the subsystem or component level of aircraft and missile electronics

    - Evaluation of equipment modifications

- F-4 Weapons Guidance Engineering Test Facility (WGETF), Ogden Air Logistics Center, Hill Air Force Base, Utah, provides the capabiltiy to test modifications to the radar system of F-4 aircraft and to attempt to determine field faults within the system. It also provides the capability to test all Ogden Air Logistics Center (ALC) prime aircaft weapons delivery systems and associated missiles and guided bombs.

- 508 TFG Avionics Support Facilities Data, Ogden Air Logisitcs Center, Hill Air Force Base, Utah, acts as repair facility for communications, navigation, weapons control, instrument, and auto flight control subsystems of theF-105 and T-33 avionics systems.

- Electronic Warfare Avionics Integration Support Facility, Warner Robins Air Logistics Center, Robins Air Force Base, Georgia, is the prime AFLC software support for all present and future reporgrammable airborne electronic warfare systems. It will provide an organic software change implementation capability for this type of system. It provides a self-sufficient capability to analyze, change, verify, and maintain system software.

Table A-1. RADAR SYSTEM TEST REQUIREMENTS AND RANGE CAPABILITIES

Test Requirement	Operational Range	Test Precision Required: Most Demanding	Acquisition: Detect.	Acquisition: Class.	Acquisition: Ident.	China Lake	Edwards	Eglin	Ft. Huachuca	HWD	Nellis/ Luke	Rome	White Sands
TSPI[1]													
Altitude (ft)	200 - 80K	1% - 12 ft.				F	F	F	F	P	P	P	P
Range (nm)	0 - 100	1%				10^4	10^4	10^4	10^4	10^4[7]	10^4[8]	10^4[9]	10^4
λx (mil)		±1.0				0.1	0.2	0.2	0.2	0.1	0.2	0.2	0.2
Range (ft)		±3040				30	30	30	30	6.0	30	30	30
Swath (nm)	5 - 20												
Targets													
Engineering						N	P	P	F	N	N	P[10]	N
Min. Detectable Target (m^2)	5 - 100 m^2		3	1	0.5		1 - 1045	U	F				
Dynamic Range	10 log σ_2/σ_1	3	3	3	3		0 - 30	U	F[5]				
Resolution (ft)	0.5 - 100	0.5	0.5	0.2	0.1		3.0	50	3.0				
Moving Target Indicator						N	N	N	F[6]	N	N	N	N
Min. Detectable Vel. (knots)	0 - 50	1.0	1.0	NA	NA				F				
Detectability Envelope (knots)	0 - 50	1.0	1.0	NA	NA				F				
Change Detection						N	N	N	F	N	N	P	N
Tactical						P	N	F	N	N	F	N	N
Electronic Warfare						F	N	F	N	N	F	N	N
(ECM/ECCM)[2]						P	P	F	F			P	P
Timing						F	F	P	F	F	P	P	P
Telemetry						F	F	F	F	P	P	H	P
Meteorology													
Routine[3]							R				R	R	
Special						S		S	S	S			S
Calibration Labs						F	F	F	F	F	N	F	F
Image Interpretation Facility[4]						N	N	P	F	F	N	F	N
Data Processing													
Real Time						F	F	F	F	P	P	P	P
Quick Look						F	F	F	P	P	P	N	P

[1] RF systems only. Assumes necessary attitude and accelerations available from aircraft.
[2] Non-EW RF measurement capability.
[3] Routine service weather available.
[4] Independent of system under test.
[5] Range personnel built reflectors to meet user needs.
[6] Based on claims of range managers.
[7] Based on use of the integrated radar/photo system.
[8] Using Ft. Huachuca radar.
[9] If the FPS-14 at Verona is used.
[10] Targets established for Sapphire test.

F = Full Capability
P = Partial
N = None
U = Unknown
R = Routine
S = Special

TABLE A-[illegible]. LASER SYSTEM TEST REQUIREMENTS AND RANGE CAPABILITIES

Range / Capability	[illegible]	Environment: [illegible]	Environment: [illegible]	Environment: [illegible]	Targets: [illegible]	Targets: [illegible]	Designator Testing (Uncertainty): [illegible]	Designator Testing (Uncertainty): [illegible]	Designator Testing (Uncertainty): [illegible]	Designator Testing (Uncertainty): [illegible]	Search/Track System Testing (Uncertainty): Sensitivity (w/cm²)	Search/Track System Testing (Uncertainty): Field of View (mr)	Search/Track System Testing (Uncertainty): Field of Regard (mr)	Search/Track System Testing (Uncertainty): Angular Resolution, Tracking Smoothness, Signal Discrimination (mr)	Type TSPI Considered	Atmospheric Measurements[9]
[illegible] AF	[illegible]	L	N,F	[illegible]	No	No	-	-	-	-	-	-	-	-	-	O
[illegible]		[illegible]	[illegible]	-	Yes	Yes	[illegible] mr	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	AN FPS-105	O
[illegible]	[illegible]	[illegible]			No	No	-	-	-	-	-	-	-	-	CONTRAVES	-
[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	No	-	-	-	-	-	-	-	-	CONTRAVES	-
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	Yes	[illegible] mr	-	[illegible]	[illegible]	[illegible]	[illegible]	0.07	0.07	CONTRAVES	T
[illegible]	-	[illegible]	[illegible]	-	No	Few	-	-	-	-	-	-	-	-	AN FPS-16	O
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	No	No	-	-	-	-	-	-	-	-	CONTRAVES	O
[illegible]	-	[illegible]		-	No	[illegible]	-	-	-	-	-	-	-	-	-	-
[illegible]	-	[illegible]	[illegible]	-	Yes	Yes	-	-	-	-	-	-	-	-	CONTRAVES	N
[illegible]	[illegible]	[illegible]	[illegible]		Yes	No	[illegible] mr	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	CONTRAVES	O
[illegible]	[illegible]	[illegible]			No	No	-	-	[illegible]	-	[illegible]	.11	0.11	0.11	ASKANIA	T
[illegible]	-	[illegible]	[illegible]	[illegible]	No	No	-	-	-	-	-	-	-	-	-	-
[illegible] AMTE	-	[illegible]	[illegible]		[illegible]	No	-	-	-	-	-	-	-	-	AN FPS-16	-
[illegible]	[illegible]	[illegible]	[illegible]	-	Yes	Few	[illegible] mr	.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.07	CONTRAVES	T
[illegible]	[illegible]	[illegible]		-	Yes	Few	[illegible]	[illegible]	[illegible]	-	-	-	-	-	PATS[8]	O
Requirement			[illegible]		Yes	[illegible]	[illegible] mr	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	0.05	-	T

[illegible] and [illegible] search/track system.
[illegible] forest, [illegible] G = Grass, [illegible] = Desert vegetation, N = None,
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] may be a [illegible].
[illegible], T = Standard weather plus transmission path measurements.

Table A-3. SEARCH TRACK AND IR IMAGING TEST REQUIREMENTS AND RANGE CAPABILITIES

Test Requirement	Test Precision Required						Capability Analysis						
	Location	V/H Compen.	Target Acquisition			Weapon Delivery Position	China Lake	Edwards	Eglin	Ft. Huachuca	Patuxent River	Vandenberg	White Sands
			Detect.	Class.	Ident.								
TSPI Range	3.33 yds ea axis						5 yds	8 yds	5 yds	5 yds		1 yd	3 yds
Aircraft Flight and Navigation System													
Attitude	0.1°												
Velocity		5 ft/sec											
Acceleration		0.1 g											
Targets													
Engineering													
Visible Resolution			2.5 ft	1 ft	0.5 ft	1 ft	N	F	F	F	F	N	N
IR Resolution			0.5°C	0.2°C	0.1°C	0.2°C	N	F	F	0.5°C	0.1°C	N	N
Visible Geometric Fidelity			1 resolution element				N	F	F	F	F	N	N
IR Geometric Fidelity			1 resolution element				N	F	F	F	F	N	N
Thermal Sensitivity IR temp. calib.							N	N	F	0.5°C	0.1°C	N	N
Tactical							Yes	No	Yes	Few	No	No	Few
Environment				Variety			Desert and Mts.	Hills and Level	Jungle	Hills and Level	Level and Grass	Shore and Industrial	Desert and Mts.
Airborne Photometer and Radiometer													
Visible Reflection									F	F			
IR Irradiance									F	F			

Note: N = None, F = Full Capability.

ANNEX H

INITIATIVES FOR IMPROVING THE ACQUISITION PROCESS

On 30 April 1981, Deputy Secretary of Defense Frank Carlucci announced major policy changes in the acquisition process under the new administration. The major theme of the changes is to achieve enhanced readiness, reduced acquisition costs and shortened acquisition time through controlled decentralization. The total impact on avionics subsystems remain to be seen. However, all of the services are demonstrating a seriousness of purpose in the implementation of these initiatives. These thirty-one decisions are presented here for use by the avionics community in future acquisition and modification programs:

0 Management Principles includes improved long range planning; greater delegation of responsibility, authority and accountability; emphasis on low-risk evolutionary alternatives; more economic production rates; realistic budgeting and full funding; improved readiness and sustainability; and strenghtening the industrial base.

0 Preplanned Product Improvement should be used as a means of achieving performance growth.

0 Multiyear Contracting should be used, on a case-by-case basis, to reduce unit production costs.

0 Increased Program Stability in the Acquisition Process should be achieved by fully funding Research and Development and Production contracts in order to maintain the established baseline schedule.

0 Encourage Capital Investment to Enhance Productivity through legislative, contractual and other economic incentives.

0 Budget to Most Likely Costs to achieve more realistic long-term defense acquisiiton budgets, reduce apparent cost growth and achieve increased program stability.

0 Economic Production Rates should be used whenever possible and advantageous.

0 Assure Appropriate Contract Type in order to balance program needs and cost savings with realistic assessment of contractor and Government risk.

0 Improve System Support and Readiness by establishing objectives for each development program and "designing in" reliability and readiness capabilities.

0 Reduce the Administrative Cost and Time to Procure Items by raising the limit on purchase order contracts and reducing unnecessary paperwork and review.

0 Incorporate the Use of Budgeted Funds for Technological Risk by quantifying risk and incorporating budgeting techniques to deal with uncertainty.

0 Provide Adequate Front-End Funding for Test Hardware in order to emphasize early reliability testing and to permit concurrent development and operational testing when appropriate.

0 Government Legislation Related to Acquisition which unnecessarily burden the acquisition of contracting process should be eliminated.

0 Reduce the Number of DOD Directives by performing a cost-benefit check and requiring that the Defense Acquisition Executive (DAE) be the sole issuer of acquisiiton-related directives.

0 Funding Flexibility should be enhanced by obtaining legislative authority to transfer individual weapon system contracting funds to Reseach, Development, Testing and Evaluation when appropriate.

0 Contractor Incentives to Improve Reliability and Support should be developed and introduced into Requests for Proposals, specifications and contracts.

0 Decrease Defense System Acquisition Review Council (DSARC) Briefing and Data Requirements in order to increase the efficiency of DSARC and other program reviews.

0 Budgeting Weapons Systems for Inflation should be adopted in order to more realistically portray program cost.

0 Forecasting of Business Base Condition at Major Defense Plants by coordinating interservice overhead data and providing program projections to plant representatives.

0 Improve The Source Selection Process by placing added emphasis on past performance, schedule realism, facilitization plans and cost credibility.

0 Develop and Use Standard Operational and Support Systems to achieve earlier deployment and enhanced supportability with lower risk and cost.

0 Provide More Appropriate Desigr to Cost Goals to provide effective incentives during early production runs.

0 Assure Implementation of Acquisition Process Decisions by initiating an intensive implementation phase.

0 DSARC Decision Milestones should be reduced to "Requirements Validation" and "Program Go-Ahead".

0 Mission Element Need Statement (MENS) should be submitted with Service Program Objective Memorandum (POM) thus linking the acquisition and PPBS process.

0 DSARC Membership should be revised to include the appropriate Service Secretary or Service Chief.

0 The Defense Acquisition Executive (DAE) should continue to be the Under Secretary of Defense for Research and Engineering (USDRE).

0 The Criterion for DSARC Review should be increased to $200M RDT&E and $1B production in FY80 dollars.

0 Integration of the DSARC and Planning, Programming and Budgeting System (PPBS) Process will be achieved by requiring that fiscally executable programs be presented for DSARC review.

0 Logistics and Support Resources will be included in the Service POM by weapon system, and Program Managers will be given more control of support resources, funding and execution.

0 Improved Reliability and Support for expedited ("Fast Track") programs will be achieved by requiring an early decision on the additional resources and incentives needed to balance the risks.

ANNEX I
ELECTRONIC WARFARE ACQUISITION
PROBLEMS AND SOLUTIONS

On 19 June 1981, Under Secretary of Defense for Research and Engineering, Dr. Richard Delauer issued a memorandum which addressed EW acquisition problems and actions aimed at solving the problems. The problems and related solutions pertain to the areas of intelligence, procedural delays in EW acquisition, test and evaluation, logistics and rapid acquisition procedures. The following excerpts from the memo are presented for use by the Avioncis Community in planning future acquisition programs.

a. Intelligence

(1) Problem: OMB Circular A-109 and DoD 5000.1/DoDI 5000.2 state that defense system acquisition programs must be based upon a "validated threat." Many OSD and Service officials interpret the term "validated" to mean a threat that has been proven and documented. The result is that only those EW system programs designed against hostile equipment already deployed or well along in development are funded. Therefore, we are behind the emerging threat before we start. Using current practices, there is no possibility that we can field the EW capability needed in time to counter the changes predicted in the Soviet threat during the next ten years.

(2) Solution: The term "validated threat" should be interpreted to mean a projected threat, approved by DIA, of estimated future enemy capabilities based upon intelligence, extrapolation of existing enemy weapon designs, and anticipated technological advances. Expand our threat projection capabilities and efforts. Revised DoDD 3222.4, Electronic Warfare Administration, to require: (a) the Service sponsor of the EW program to develop—in consultation with DIA and other intelligence agencies—current and projected threat data and most probable threat scenario(s), (b) DIA to validate the projected threat(s), and (c) all EW program managers to design their EW equipment to the DIA validated threat(s).

b. Procedural Delays in EW Acquisition

(1) Problem: The average time from approval of requirements to fielding of initial EW systems is about ten years. Case studies showed variations from 6 2/3 to 13 1/2 years. The RAN/D&E process which requires that contracts greater than $100K be staffed and approved by an Assistant Secretary level authority is very time consuming. Programmatic delays of a year or greater are caused by slow contracts paper work, excessive program reviews by higher authority, cumbersome ILS planning, etc. Total program cost increases of $100M and greater occurred from contractor teams standing-by awaiting government action during those delays without any identifiable system performance benefits. The series approval chain now practiced has been slow and costly, and the improvement in EW system performance expected to result is not apparent. The government usually spends all the funding planned, but the cost of the delays results in fewer systems for inventory.

(2) Solution: For EW systems, approval for production shall be consistent with OMB Circular A-109, DoDD 5000.1, DoDI 5000.2, and DoDD 5000.3 but further defined so that decision authority for each program is designated at a specific level in the DoD management structure. The requirement to report back to higher authority before proceeding is discouraged. Actions such as release of long-lead funding, funding of pilot production lots, use of short-term contractor support to permit fielding equipment before full provisioning is complete, and other actions designed to minimize program gaps and attendant costs are encouraged. Concurrency is to be utilized wherever practical.

c. Test and Evaluation

(1) Problem: Recognizing fully that test and evaluation of EW systems are important and necessary, current procedures for developing and approving test schedules do not always consider the total resource impact to the overall acquisition program. Some OT&E tests have been for items or features or against threats not part of the DCP or development program. Negative reports on minor issues have been taken out of the context intended and were the basis upon which decision-makers delayed procurement of systems that are far superior to inventory military capability.

(2) Solution: The developer should ensure that increased management attention is given to accomplishing early coordination among the user, developer, and tester. Particular attention must be given to the identification of realistic minimum operational requirements and quantitative performance thresholds. In addition, increased care must be exercised in formulating the minimum number of critical questions to be answered by test and evaluation. The Test and Evaluation Master Plan (TEMP) should include a brief explanation of the methodology used to determine the test time required to answer the critical questions. If during the OSD review of the TEMP (or equivalent lower level test plan) it is determined that resources are not available to satisfy the testing schedule, a reevaluation of the critical questions will be accomplished. The reevaluation will identify how many and to what extent critical questions can be answered by test and evaluation. In this situation, the decision-makers must be prepared to accept greater risk since less testing will be done. The final OT&E test report will include an assessment of the EW systems: (a) performance vs the thresholds and goals of the DCP and TEMP, (b) capability against the DIA approved threat if different from the DCP and TEMP threat, and (c) performance as tested relative to existing similar military systems if applicable.

d. Logistics

(1) Problem: Poor integrated logistics support planning has been a significant factor in several EW acquisition programs. As they should, all Services want systems to be organically supported at the time of fielding. However, awaiting full logistics support and complete reliability and awaiting full logistics support maintainability testing would usually result in long and costly gaps between the RDT&E phase, full-rate production, and fielding the systems. The developer must take the initiative in structuring a shortened acquisition program that will result in the logistics being delivered with the fielded systems and the R&M requirements met in the early production models.

(2) Solution: Program actions should be initiated in the development and operation phase to provide logistics support concurrent with hardware deliveries to offset the schedule risk and to substantially speed up reliability growth. These actions should include: (a) early identification of critical R&M and test equipment requirements, (b) formation of incentives such as warranties for the contractors to design and grow the R&M to meet field requirements, (c) planning contractor field support for initial production, and (d) setting aside procurement funds specifically for correction of R&M logistics deficiencies.

e. Rapid Acquisition Procedures

(1) Problem: EW acquisition practices which result in ten-year EW RDT&E programs cannot counter the Soviets who have deployed more than 25 different fire control radars since 1970. Much of the EW equipment in inventory is badly outdated, and we are not taking advantage of our technological capabilities. Our EW posture is such that we will have to take unpracticed QRC actions to provide EW capabilities when we face conflict again, just as we did at the beginning of the Southeast Asia conflict.

(2) Solution: EW acquisition programs should be executed under three different sets of implementation procedures. Development and acquisition of new EW systems or updates to existing EW systems for inventory aircraft required to meet changes in the existing threat, should employ rapid acqisition procedures, i.e., compress the acquisition process through the use of concurrent actions. Under these rapid acquisition procedures, we should exercise the steps in the normal acquisition process, particularly the T&E and logistics support, but execute the actions within specific not-to-exceed times. Execute combined and concurrent actions wherever possible and exercise competent engineering experience and judgment where necessary to reduce time and costs. QRC procedures should be available and well practiced for true emergency situations, including war. New EW developments for new aircraft, ships, etc., should follow the normal acquisition procedures followed by the new aircraft, ships, etc.

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